NETWORK WORLD

THE WEEKLY FOR LEADING USERS OF COMMUNICATIONS PRODUCTS & SERVICES VOLUME 4, NUMBER 42 OCTOBER 19, 1987

SPECIAL SECTION: T-1

# How to manage T-1 procurement

**BY VICTORIA BLACKFORD**
Special to Network World

Evaluating T-1 equipment is a crucial management task — and it's far more complicated than merely comparing features. T-1 network management is directly dependent on the multiplexing equipment installed at the ends of the T-1 span.

Features such as the number of T-1 lines per node, maximum input channels and maximum synchronous input rate in bit/sec provide superficial means for reviewing vendors and are insufficient ways of

Continued on page 41

▶ *SWITCH STRATEGIES*

# AT&T plans merge of Systems 75/85

**BY JOSH GONZE**
Staff Writer

BASKING RIDGE, N.J. — AT&T confirmed last week that it plans to gradually merge its mid-range System 75 and top-of-the-line System 85, a move designed to consolidate its PBX product line and enable users to protect their switch investments.

Under the plan, which AT&T termed a "statement of direction," System 85 users will be able to take the smaller switches and modify them for use as switch modules within a larger System 85. In addition, AT&T said it intends to reduce the System 85's footprint by enabling it to use the more efficient, high-density line cards of the System 75.

"Over the next couple of releases of both systems, our intent is to begin bringing those systems closer together," said Scott Griffiths, System 85 planning manager at AT&T. "This will allow customers to move from one sys-

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▶ *CORPORATE RESTRUCTURING*

# US Sprint rethinks marketing strategy

*Reorganizes sales units to target big business.*

**BY PAM POWERS**
Senior Editor

KANSAS CITY, Mo. — US Sprint Communications Co. last week announced that it is reorganizing its sales and marketing operations to control costs and better target business accounts.

Under the reorganization, sales and marketing operations will be realigned into three groups designed to target distinct types of customers — Fortune 1,000 businesses, mid- to large-sized corporate users, and small business and residential customers. The three groups replace seven regional divisions that shared responsibility for marketing services.

Analysts said the restructuring will strengthen US Sprint's efforts in landing large corporate accounts, the most profitable sector of long-distance business and the one that contributes the bulk of most carriers' revenues.

The reorganization will affect about 2% of US Sprint's 12,000 employees, who will report to other managers, be relocated or laid off, according to US Sprint spokesman Christopher Clouser. "We will lay off people only when there are two people performing the same job," Clouser said. "That will happen only in staff support func-

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▶ *COMMUNICATIONS MANAGERS ASSOCIATION*

# CMA: Helping users cope

*Regional group boasts nation's top companies.*

**BY MICHAEL FAHEY**
Senior Writer

UNIONDALE, N.Y. — The Communications Managers Association (CMA) is helping network professionals at some of the largest companies in the U.S. cope with constantly changing tariffs, a shifting regulatory environment and increasingly complex equipment and service offerings from a multitude of

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**A profile of the Communications Managers Association**

| | |
|---|---|
| **Charter:** | To keep managers abreast of changing technology, regulations, legislation and new product and service offerings |
| **Organization:** | Regional, serving member companies in the Northeast |
| **Founded:** | 1948 |
| **Founder:** | Walter Young, then communications manager with Shell Oil Co. |
| **Current president:** | Donald Gaffney, vice-president of communications, Fundamental Information Systems, a subsidiary of Williams Street Brokers, New York |
| **Current membership:** | 208 companies and nearly 500 individual members |
| **First conference:** | 1976 |
| **Headquarters:** | Bernardsville, N.J. |

SOURCE: COMMUNICATIONS MANAGERS ASSOCIATION

## NETWORK LINE

### News

▶ Chevron develops a micro-based expert system that diagnoses network problems. Page 2.

▶ T-1 multiplexer market rivals Timeplex and Network Equipment Technologies post impressive gains in their latest financial reports. Page 2.

▶ Early users of X.400 offerings are finding innovative applications for newly available tools, such as linking users on diverse systems and extending networks to suppliers. Page 4.

▶ Interlink Computer Sciences gets a jump on DEC as it unveils a MicroVAX II-based gateway that ties DECnet networks to SNA environments. Page 4.

▶ Aiming to improve computer sales and to cut its losses, AT&T reorganizes its Data Systems division. Page 6.

### Features

▶ Under pressure from top management to develop an efficient T-1 network? This Special Section examines the balancing act managers often must perform with technology, personnel and costs. Page 38.

NEWSPAPER

▶ *LOCAL NETWORKS*

# Freddie Mac finds gateways trouble

*Struggles to link LANs to host.*

**BY PAULA MUSICH**
Senior Editor

WASHINGTON, D.C. — When technical services personnel at the Federal Home Loan Mortgage Corp., known as Freddie Mac, decided to link remote Novell, Inc. local networks through gateways to a central IBM mainframe, they knew the project would be a challenging one.

But, after struggling through 13 months of problems implementing gateways from National Advanced Systems, Inc. (NAS) and CXI, Inc., Freddie Mac's technicians said they feel as if they've been beta testing products

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▶ *ARTIFICIAL INTELLIGENCE*

# Chevron takes expert system through paces

**BY MARY LINEHAN**
Staff Writer

SAN RAMON, Calif. — With the hope of automating routine network management tasks, Chevron Info Technology Co. (CITC) has developed a microcomputer-based expert system that diagnoses and offers solutions for network problems.

Still in beta test, DRnet — short for Doctornet — was developed here by the computer operations department of CITC, a division of oil giant Chevron Corp. The system, designed to help network operators and analysts manage Chevron's 10,000-terminal IBM Systems Network Architecture network, monitors modems, terminal controllers and analog circuits.

"We joke that DRnet is still in med school," said Nahlini Joshi, a systems analyst and project manager for DRnet. "He's in beta test, so he's still learning. But now that he's on the floor, it's more like an internship."

DRnet can pinpoint problems and run tests by issuing VTAM commands through IBM's Network Communications Control Facility (NCCF) on one of the company's several IBM hosts. NCCF is a product that allows other programs or users to control network operations.

Describing how DRnet will work, Joshi said the Chevron help desk will spend up to five minutes working on a problem. If unable to solve it, the help desk will write up an incident report and pass it along to a network operator. The operator will then log on to DRnet and feed the problem into the system.

For generic problems, like blank terminal screens, "the operator can choose to let DRnet issue its own commands to diagnose and offer advice to solve the problem, or the operator can issue the commands himself, based on the steps DRnet suggests," Joshi said.

The system guides the operator through the solution. "When operators input a problem, DRnet tells them, for example, to run a status link test," Joshi explained. "The operator runs the test and tells the system that the receive data light was flickering or that the transmit clock was high. The system will then counter with something like 'From the information you've given me, I deduce that the remote site modem is fine,' or 'The central site modem is the problem.' "

According to Joshi, DRnet will

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▶ *MUX MARKET*

# Timeplex, NET record big earnings

**BY PAM POWERS**
Senior Editor

T-1 multiplexer market rivals Network Equipment Technologies, Inc. (NET) and Timeplex, Inc. last week reported strong increases in revenues and earnings for their latest fiscal quarters.

Timeplex and NET have become Wall Street darlings after a series of strong quarters. Jeremy Frank, program director for Enterprise Network Strategies with Stamford, Conn.-based Gartner Group, Inc., said his company estimates that Timeplex and NET will share more than 50% of the T-1 multiplexer market evenly within three years.

NET posted a 446% increase in earnings, increasing to $4.2 million for the quarter ended Sept. 27 from fiscal 1987 second-quarter earnings of $780,000. Revenue grew 91% to $20.5 million, as compared with last year's $10.7 million.

"This is tangible evidence of the strong growth in the T-1 multiplexer market," said NET spokesman Stan DeVaughn. NET signed a large contract with Merrill Lynch & Co., Inc. during the quarter for a network based on NET's IDNX multiplexers.

DeVaughn said about 25% of the company's revenue is contributed by new contracts, and the other 75% is generated by add-on business from NET's existing customer base.

DeVaughn said NET has not yet made any sales through IBM, which is marketing NET's products.

But, Frank said, the company will benefit from the relationship. "IBM opens up a huge customer base to NET," he said.

Timeplex also enjoyed a profitable quarter. On revenue of $42.2 million for the fiscal first quarter ended Sept. 30, Timeplex posted earnings of $4.9 million, representing a 27% revenue increase, as compared with $33.3 million last year, and a 115% increase in earnings, as compared with last year's $2.3 million.

A Timeplex spokesman said the

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*Network World* wants to make its news coverage even better, and for that we ask your help. If you know of an interesting event that just occurred or is about to occur, please call. We'd also like to know how you optimize your networks. Call Editor Bruce Hoard toll free at (800) 343-6474.

**Corrections:** The story "Co-op inks cut-rate PBX pacts" (*NW*, Oct. 5) implied that Amerinet, a consortium of health care providers, negotiated lower private branch exchange rates with Northern Telecom, Inc. and NEC America, Inc. Amerinet negotiated with the companies' equipment distributors.

The article also incorrectly stated that neither Northern Telecom nor NEC America maintains a direct sales force.

In the article "Bridges, gateways open to confusion" (*NW*, Oct. 5), an error occurred in the discussion of Ethernet compatibility on page 35. The passage should have read "Ethernet Versions 1 and 2 use the same address location for the type field that the media access control specification of IEEE Ethernet uses for the length field. For that reason, the 802.3 version can't communicate with Versions 1 and 2." *Network World* regrets any confusion this error may have caused.

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## DATA DELIVERY/ NET MANAGEMENT

V.32-compatible modems are hot, and a pack of vendors are vying with early leaders Codex and Concord Data Systems for market share. **Page 15.**

## TELECOM TRENDS

The IBM 9751 CBX should help stop Rolm's market share slide, but winning customers from the competition won't be easy for Big Blue. **Page 17.**

## LOCAL NETWORKING

IBM's new network monitoring and performance analysis product for its Token-Ring Network is welcomed by users, but analysts question its usefulness for large networks. **Page 19.**

## COMMUNICATIONS MANAGER

The Committee of Corporate Telecommunications Users is a strong voice for its diverse members. **Page 25.**

## NEW PRODUCTS AND SERVICES

Network Software Associates announces software that enables personal computer applications to access applications on other micros. **Page 31.**

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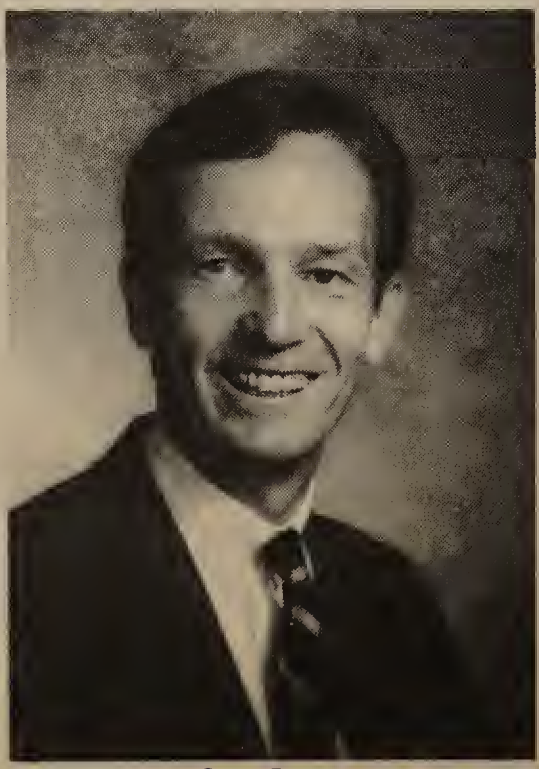
▶ *NETWORK WORLD*

# Beach named publisher



Gary Beach

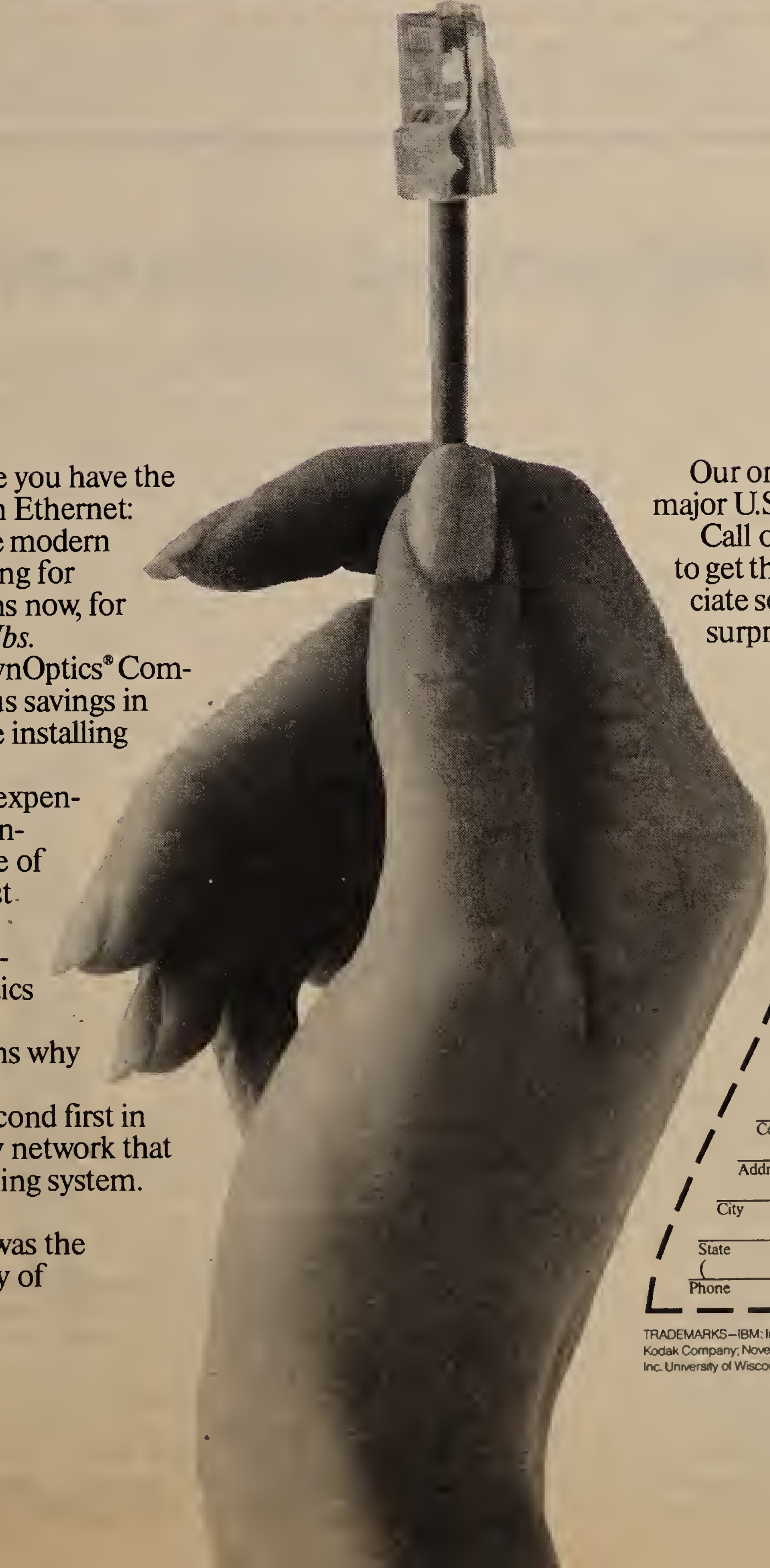
Gary Beach, former national sales manager for *Data Communications* magazine, has been named publisher of *Network World*.

Beach brings more than a decade of experience in the high-technology publishing industry. He spent six years in sales management at McGraw-Hill, Inc., which publishes *Data Communications*. He served two years as director of research for McGraw-Hill Research, Inc.

Before working at McGraw-Hill, he served as a district manager for *Teacher* magazine, a MacMillan, Inc. publication. He was also project director for the research firm of Hagen Associates in New York.

"Gary's extensive experience in the publishing field will help him lead *Network World* into its second phase of growth," said Jim Povec, president of CW Publishing, Inc.

# SURPRISINGLY, THE BEST WAY TO RUN ETHERNET IS ALSO THE EASIEST.



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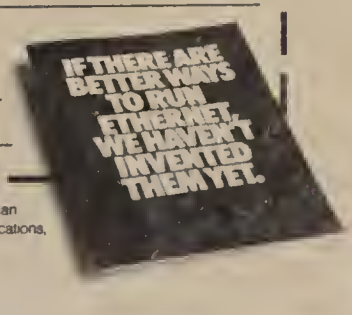
IF THERE ARE BETTER WAYS TO RUN ETHERNET, WE HAVEN'T INVENTED THEM YET.

TRADEMARKS—IBM: International Business Machines Corporation; Kodak: Eastman Kodak Company; Novell: Novell, Inc., SynOptics and LattisNet: SynOptics Communications, Inc. University of Wisconsin: University of Wisconsin

▶ *NETWORK INNOVATIONS*

# X.400 wins U.S. fans

## *Firms find inventive uses for new tools.*

**BY MARY PETROSKY**
West Coast Correspondent

The increasing availability of X.400 products has brought early U.S. users of the technology new solutions to problems ranging from connecting diverse internal mail systems to linking to outside vendors.

Pacific Bell is deploying a Digital Equipment Corp. system based on the electronic-mail interface standard in order to link multiple E-mail systems used internally. Likewise, Weyerhaeuser Co. recently purchased DEC's Message Router X.400 Gateway as a first step toward linking E-mail systems running on different vendors' computers.

Several organizations, including the U.S. Department of Agriculture Forest Services, are employing an X.400 service from Telenet Communications Corp. to send electronic messages to other organizations. Bridge Communications, Inc. is using Telenet's service to communicate with Data General Corp., one of its vendors.

San Francisco-based Pacific Bell recently purchased two DEC VAX 8550 superminicomputers and some standard DEC X.400 software, including DEC's message-routing software. With this hardware and software, Pacific Bell plans to set up two X.400 switches. The company hopes to link its 16,000 E-mail users, currently spread across more than a dozen different E-mail systems, said Jeanne Bracken, director of message-handling systems.

To date, the telephone company has developed its own software for linking users on its most commonly used systems, which include IBM's Professional Office System, DEC's All-In-1 and DG's Comprehensive Electronic Office (CEO).

"While that method meets the basic interconnection needs, it's not efficient," Bracken said. Users often get meaningless characters in their messages, and developing and maintaining the patches consumes programming resources.

Pacific Bell will be setting up one X.400 switch in Northern California and one in Southern California. These switches will be linked via an X.25 packet-switching network, Bracken said. DEC is working with Pacific Bell to develop some software, including network management software and the interface between users and the X.400 network. Bracken also said it's likely Pacific Bell will use DG's X.400 interface to support CEO.

She added that the company would like to tie its Unix and IBM users into the X.400 network, but X.400 interfaces for these environments are not now available in the U.S. "IBM has a PROFS-to-X.400 interface available in Europe," Bracken noted, adding she'd like to see it in North America.

"We expect to be implementing this early next year and pilot-testing it sometime in the second quarter," Bracken said. Once the X.400 network is set up, pilot users will be able to dial into the network. The X.400 switches will handle functions such as routing and store-and-forward.

Although providing a ubiquitous E-mail service is the main goal of the X.400 project, Pacific Bell also has an eye on other applications for the technology. "We're looking at a range of enhanced applications, such as sending forms and company announcements over the system," Bracken said. "PC file transfer is another application that will be available."

Weyerhaeuser's Bob Lovestedt recently purchased DEC's Message Router X.400 Gateway with the intention of linking users on DEC,

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▶ *DEC-TO-IBM*

# Internet offers high-speed gateway

**BY JIM BROWN**
New Products Editor

FREMONT, Calif. — Interlink Computer Sciences, Inc. recently introduced a high-performance gateway based on a Digital Equipment Corp. MicroVAX II that links DECnet networks with IBM Systems Network Architecture environments.

Introduction of a MicroVAX II-based gateway gives Interlink a jump on DEC, which is said to be developing a MicroVAX version of its current PDP-11-based DECnet/SNA Gateway. Analysts have criticized 16-bit PDP-11 SNA/DECnet gateways as slow, a problem that should be resolved by the 32-bit architecture of the MicroVAX.

Interlink's 3732 Model 400 gateway links to the block or byte multiplexer channel of an IBM mainframe and into DECnet via Ethernet. It supports up to 128 IBM 3270-type terminal sessions, enabling devices in either environment to access applications and data over an aggregate link that operates at up to 800K bit/sec.

The previous top-of-the-line Interlink gateway, which was based on a DEC PDP-11, supported up to 32 sessions and an aggregate link speed of up to 500K bit/sec.

The 3732 Model 400 works in conjunction with Interlink mainframe software that runs under IBM's MVS and VM operating systems and performs most of the protocol processing, according to Jim Pimentel, Interlink's vice-president of marketing. That mainframe software off-loads some of the work from the MicroVAX II and uses little of the mainframe's resources, he said.

### Moving to the MicroVAX

The 32-bit MicroVAX II also processes link requests more quickly than previous gateway models. "In order for us to move to a higher level of performance, we needed a more powerful machine and decided to move to the MicroVAX II," Pimentel said.

DEC's current DECnet/SNA Gateway supports two multiple session links to an IBM 3725 front-end processor at a maximum speed of 56K bit/sec each. But the box does the protocol processing itself on the PDP-11 and can get bogged down from time to time, according to Dave Terrie, editor of "Patricia Seybold's Network Monitor" newsletter and president of Scituate, Mass.-based NewPort Consulting. "With a faster engine such as a MicroVAX, DEC will be able to do protocol processing much more quickly," he said.

The new gateway DEC is said to be developing would speed that protocol processing by three to four times. It will not, however, take advantage of the greater performance that channel-attaching to an IBM host provides, Terrie said. He said he believes DEC would rather continue to connect its gateway into the IBM realm through a front-end processor, because the company has little expertise designing IBM channel interfaces.

With Interlink's new product, DECnet devices view the gateway as a DECnet node, while the gateway appears to IBM mainframe-attached devices as a channel-attached peripheral. Using the gateway, devices within either environment will be able to request data within applications in the other realm. Requests are sent to the gateway, which then creates the necessary session.

### Other uses of the gateway

Optionally, the gateway will enable DEC VT-100 terminals to emulate IBM 3270-type terminals and vice versa. The product also provides links between DEC's DECmail and All-In-1 and IBM's Professional Office System running on VM-based mainframes.

As part of Interlink's Network Port Architecture, future versions of the 3732 Model 400 will enable users attached to networks running Transmission Control Protocol/Internet Protocol, Manufacturing Automation Protocol and the International Standards Organization's Open Systems Interconnect model to access the gateway and request connection to a mainframe.

The Interlink 3732 Model 400 costs $69,950 and includes the mainframe-resident software.

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▶ *NATIONAL ROLM USERS GROUP*

# Users satisfied after meet with Rolm execs

**BY MICHAEL FAHEY**
Senior Writer

SANTA CLARA, Calif. — Officers of the National Rolm Users Group (NRUG) last week expressed satisfaction with the outcome of their Oct. 9 meeting with officials from Rolm Corp. and IBM.

Meeting here two days after IBM's introduction of the 9750 Business Communications System, a new line of digital private branch exchanges that supplants existing Rolm CBX models, NRUG officers said they got assurances that IBM will continue to support the CBXs.

"They said they would certainly continue to support the CBXs as long as they are a large part of IBM's installed base of switches. They also assured us that if anyone really desired a CBX, they would still sell the CBX II series," said NRUG President Charles Garrison, who is also vice-president of telecommunications for the Chicago Board Options Exchange.

NRUG officers agreed that the meeting with the IBM and Rolm officials, including Rolm President Ray AbuZayyad and Jack Blumenstein, assistant group executive for IBM's Information Systems Group, was a positive one, although IBM would not say specifically how long it will continue to support the CBX II line. In addition, Rolm would not agree to support third-party maintenance of its switches, Garrison said.

During the meeting, which was called by AbuZayyad to discuss issues of concern to Rolm users, NRUG officers were told that all future PBX enhancements developed by IBM will be "backward-compatible," according to Garrison. "This means that, as they develop enhancements for the new box, they will make them work on the CBX II," said Garrison, adding, "We shall see."

According to Garrison, users who perform their own maintenance are particularly interested in seeing Rolm continue to make the CBX II line of PBXs available to users. "People who do their own maintenance would rather have all the same model PBXs so they do not have to carry two types of spare cards," Garrison said. In addition to having to carry extra equipment to service two lines of PBXs, in-house maintenance staffers would have to be trained to

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▶ *PRIVATE NETWORKS*

# Congress nixes net tax plan

**BY MARY LINEHAN**
Staff Writer

WASHINGTON, D.C. — The congressional Joint Committee on Taxation and the House Ways and Means Committee apparently have dropped a controversial plan that would have levied a 10% excise tax on private network communications equipment.

While congressional officials were not available for comment, sources opposed to the proposal confirmed that the committees decided not to implement the excise tax, which would have cost users an estimated $1.7 billion over the next three years.

Equipment such as private branch exchanges, packet switches, packet assembler/disassemblers, satellite earth stations, modems and microwave transceivers would have been subject to the tax ("Congress ponders tax on equipment," *NW*, Oct. 12).

However, the committees reportedly have extended the existing 3% telephone service excise tax, which has been in effect since 1914, for three years.

"Considering the other options that were on the table, we can certainly live with the 3% tax," said Brian Moir, general counsel for the International Communications Association (ICA).

"It is my hope that Congress did not consider the option to tax the equipment because it would be bad public policy," he added.

ICA is a member of a coalition that formed to fight the equipment excise. The coalition, led by IBM, also includes the Computer Software and Services Industry Association, the Electronic Industries Association, the Computer and Business Equipment Manufacturers Association, the U.S. Telecommunications Suppliers Association, the Electronic Mail Association and the Videotex Industry Association. ☐

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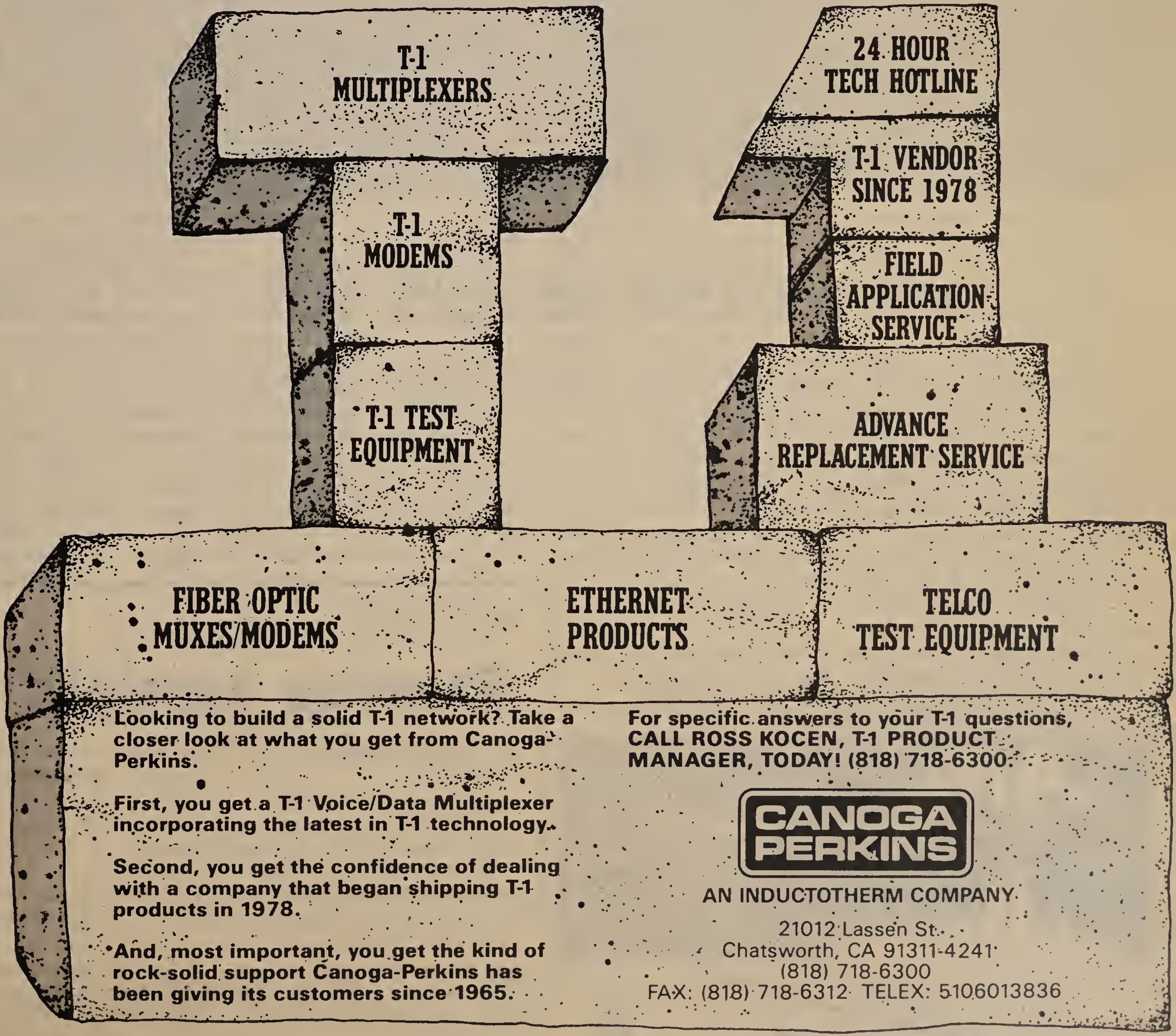

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# INDUSTRY UPDATE

## But are they really happy?

*Electronic Business Magazine* released a list of 100 executives in the high-technology industry who take home the heftiest paychecks. Compensation for these executives grew 14% over last year's figures to an average annual salary of $635,775. Among the lucky recipients are Paul Ely Jr., chairman of Convergent Technologies, Inc., John C. Lewis, president and chief executive officer of Amdahl Corp., Jim P. Manzi, president and chief executive officer of Lotus Development Corp., and John F. Akers, chairman of IBM.

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*COMPANY PROFILE*

# Digital Microwave soars

## *Products capture short-haul market, boost earnings.*

**BY PAM POWERS**
Senior Editor

SAN JOSE, Calif. — Capitalizing on major contract wins and expanding distribution channels, Digital Microwave Corp. recently posted a 181% increase in second-quarter earnings that testifies to its steady infiltration of the short-haul digital transmission market.

Since it opened its doors as a vendor of short-haul microwave and fiber-optic transmission systems in 1985, Digital Microwave has grown to become a $20 million company in 1986. The company claims to have a dominant position in all markets in which it participates, and says it holds more than a 50% share in the 23-GHz narrowband world market. Digital Microwave sells networks both directly to the end user and through such powerful channels as AT&T and Mercury Communications Ltd., one of the UK's largest common carriers.

President and Chief Executive Officer William E. Gibson attributes his company's success to a highly reliable product line that serves a growth market. The numbers tell the story: In its second fiscal quarter ended Sept. 30, Digital Microwave posted sales of $9.22 million, up 100% from $4.62 million for the similar period the year before, and earnings of $1.68 million, up 181% from $599,000 for the second quarter of 1986.

The Digital Microwave product line, called the DMC Series, consists of short-haul transmission systems made up of components including a 23-GHz narrowband microwave radio that carries up to 120 voice channels, an 18-GHz wideband radio that carries up to 672 channels, a 23-GHz radio that supports up to 28 T-1 lines and a fiber-optic system that supports up to 480 voice circuits. The 23-GHz product line has the highest sales volume, Gibson said.

Digital Microwave's short-haul microwave products are typically used to build networks

See page 10

### Digital Microwave Corp.

| | | |
|---|---|---|
| Founded: | January 1984 | |
| Location: | San Jose, Calif. | |
| | First six months ended Sept. 30 | |
| | 1987 | 1986 |
| Revenue: | $17.43m | $7.39m |
| Earnings: | $3.02m | $1.35m |
| Product line: | Digital microwave products and fiber-optic systems used primarily for construction of short-haul digital networks. | |
| Principal distribution channels: | Direct to the domestic end user, through AT&T under a private label agreement and through value-added representatives, resellers and international distributors. | |
| Customer sampling: | Common carriers — American Satellite Co., MCI Communications Corp., Pacific Bell and US Sprint Communications Co.<br>Private networks — Allstate Insurance Co., Caterpillar, Inc., Coca-Cola Co., Lockheed Corp., McGraw-Hill, Inc. and United Airlines, Inc. | |

*NETWORK WORLD* CHART

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**VENDOR VIEW**

**H. RICHARD SCHWARZ**

# Become an ISDN standards-maker

Communications equipment users can have an active influence on Integrated Services Digital Network through participation in the various organizations working to develop standards.

The types of services that will provide end users with additional capabilities and benefits are being defined by standards bodies now. These services, referred to as supplementary services, will represent ISDN's greatest impact on users.

Despite the opportunity, users as a group have yet to become very involved in the ISDN standards process. Data communications users, as compared with telecommunications users, are particularly underrepresented by the standards organizations.

Typically, those most involved with the standards have been the exchange and interexchange carriers and network equipment manufacturers. They already have a large investment in communications equipment and will be the first to make new investments in ISDN. In addition, there are several customer premises equipment providers that are participating in the standards process. It is to their advantage to be a part of the standards process in order to learn about the technology firsthand.

It makes sense for users to become involved as well. Any user that wants to learn about ISDN or believes the technology will be important in the future should become involved in the standards process. This participation is probably most logical for, and most easily justified by, users with a large commitment to communications or those that plan to implement ISDN.

> Any user that wants to learn about Integrated Services Digital Network or believes the technology will be important in the future should become involved in the standards process.

By actively participating, users have the opportunity to mold this new technology to reflect their wants and communications needs. As participants, users would also gain valuable firsthand knowledge of the technology that could pay off in the short- and long-term. With an understanding of ISDN, for example, users can evaluate their existing communications network as it relates to ISDN and plan for future ISDN migration if they desire.

Later, when it comes time to purchase and implement ISDN, these users will be ahead of the game.

Users can become involved in the organizations developing standards for ISDN in two ways. The most obvious is for users to represent their organizations. This, however, is generally limited to users in larger companies who can afford to be involved. Representatives must devote time to attend the regular meetings and to develop papers on ideas for consideration by the organization. There is also a fee for joining a standards organization and, of course, some travel cost involved by attending the meetings.

A less expensive way for users to get involved is through a user organization. In this approach, users can split the cost of membership, while sharing all the benefits. Papers could be worked on jointly to reduce the personnel investment required by a single user. For continuity, however, users may want the same representative to attend the meetings.

See page 10

*Schwarz is senior systems engineer at NCR Comten, Inc. in St. Paul, Minn.*

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*REAGAN APPOINTMENT*

# Dawson to leave FCC for DOT

**BY KARYL SCOTT**
Washington, D.C. Correspondent

WASHINGTON, D.C. — Federal Communications Commissioner Mimi Weyforth Dawson has said she will leave the FCC, having recently been nominated by President Ronald Reagan to the post of deputy secretary of the Department of Transportation, the No. 2 seat there.

Dawson has been an FCC commissioner since 1981, and her current term is due to expire June 30. Prior to joining the agency, Dawson served as chief of staff to Sen. Robert Packwood (R-Ore.), who is a member of the Senate Commerce Committee, which must confirm Dawson's appointment to the Transportation Department. Dawson is expected to continue in her FCC post until confirmation by the Senate.

Dawson's departure from the FCC will bring the number of vacancies on the commission to two. The Reagan administration has yet to name a new commissioner to fill the vacancy left by the resignation of Chairman Mark Fowler in April.

If confirmed, Dawson will assume the post now held by James Burnley, who was nominated recently by Reagan to the position of secretary of the Transportation Department.

# BRIEFS

**Equatorial Communications Co.** recently announced a five-year marketing agreement with **Nova-Net Communications, Inc.** valued at a minimum of $15 million. Under the agreement, Nova-Net, of Englewood, Colo., will purchase an Equatorial Master Earth Station and 200 satellite micro earth stations in the next year, as well as a minimum of 2,000 micro earth stations over the five-year period.

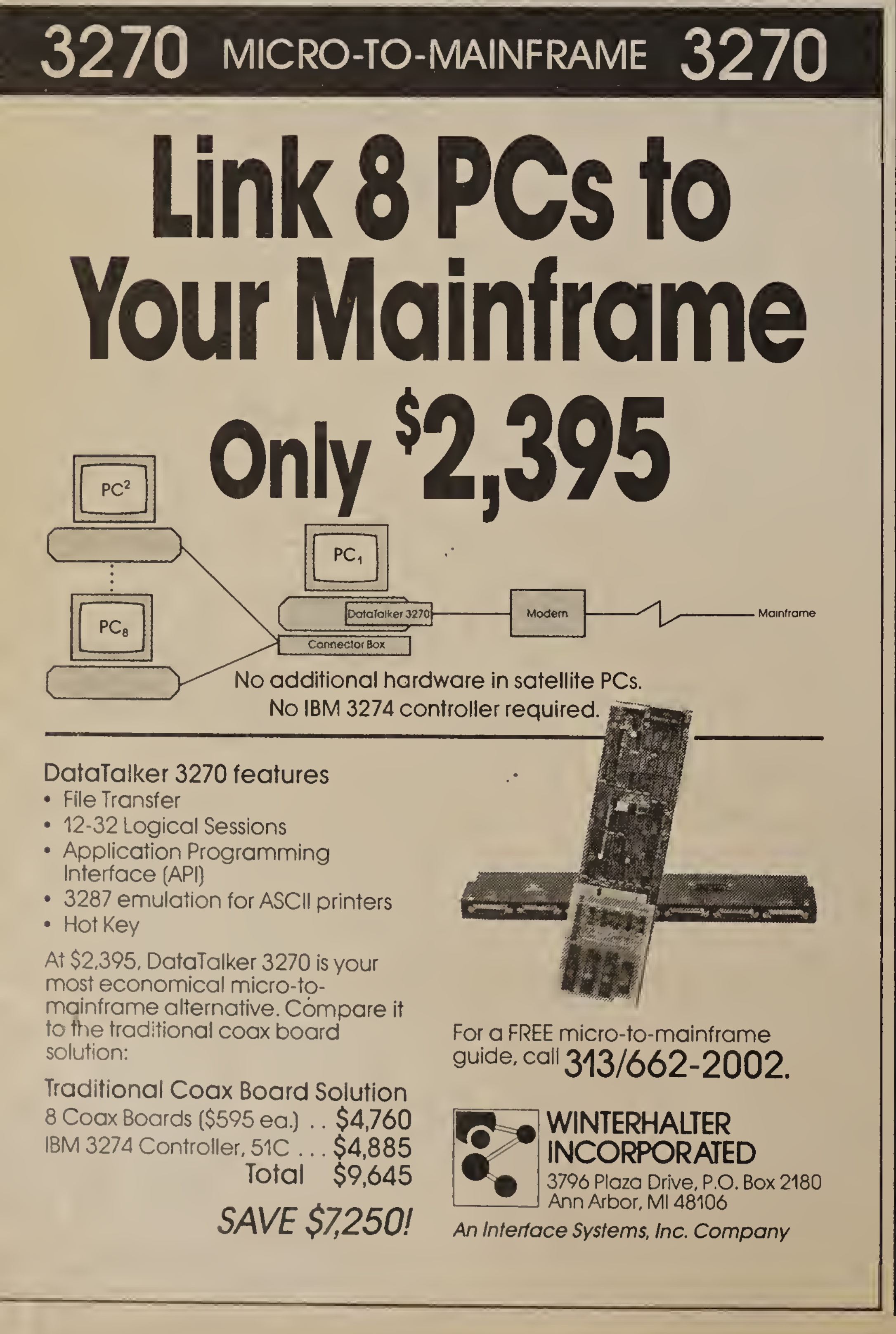
This contract follows other large orders recently announced by Equatorial. **Equatorial Satellite Systems Australia,** a distributor partly owned by Equatorial, has received an order from the **Overseas Telecommunications Commission** for a new satellite-based transaction communications network initially valued at $3 million. Scheduled for operation in the first quarter of 1988, the service, dubbed SATNET, will be the first Intelnet II-based service to work on an international basis.

**Micro-Com Industries, Inc.** also recently signed a contract with Equatorial that includes the purchase of 500 micro earth stations over the next two years. The pact, valued at $6.3 million, calls for Equatorial to provide Micro-Com with shared master station network services provided by Equatorial's satellite center located in Mountain View, Calif., as well as field installation and maintenance services nationwide.

**GM Hughes Electronic Corp.** recently approved its acquisition of **M/A-Com Telecommunications, Inc.** for $105 million. M/A-Com, whose sales for the last fiscal year were $120 million, will be renamed **Hughes Network Systems (HNS).**

GM Hughes President Donald J. Atwood said the deal makes his satellite building and operating company the largest and most comprehensive one-stop source for customized business communications networks. HNS provides GM Hughes with specialized packet-switching technology and centralized net management skills.

Austria's second largest bank, in an effort to expand its global activity, will begin implementation of its first worldwide private data communications network. **Girozentrale und Bank der osterreichischen Sparkassen AG** will use equipment and services provided by **Telenet Communications Corp.** and its Austrian distributor, **Duane Winslow G.m.b.H.** The bank will interconnect sites in the U.S., UK, Switzerland and Hong Kong to its net control center in Vienna.



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# Digital Microwave soars

continued from page 9

that support voice, data and video transmission at distances of 10 to 15 miles. Customers usually use the network for both voice and data applications.

Gibson said the company's products stand out from competitors', such as M/A-Com, Inc. and NEC Corp., because they fill customer needs for reliability and ease of maintenance. The DMC Series have built-in diagnostics and battery backup, both of which contribute to an average mean time between failure of more than 38 years, Gibson said.

And while Gibson allowed that the user "pays a premium" for Digital Microwave products, he said the cost of ownership remains lower than competitors' systems because his company's products are maintenance-free.

Jeremy Frank, program director of Enterprise Network Strategies with the Stamford, Conn.-based Gartner Group, Inc., acknowledged that the company has a "very good product line."

Jerry Hill, management assistant with the city of Anaheim, Calif., said that his group has saved more than $12,000 per year since connecting two private branch exchanges with Digital Microwave equipment. The city runs voice and data traffic over the network between two facilities, and Hill said he plans to add to the microwave and fiber network, which has eliminated a number of telephone lines for the organization. "We have had no down time — both the voice and data people are very pleased," he said.

Strong user demand for short-haul digital transmission systems is also key to Digital Microwave's success. Gibson claims that fully 80% of all communications is internal to an organization.

Digital Microwave has landed a significant number of contracts with companies such as Alabama Power Co., Frito-Lay, Inc., and United Airlines, Inc. that use their systems to transmit among facilities. Recently, the company signed a $2.1 million contract with the Defense Material Administration in Sweden.

Digital Microwave also targets local telephone companies, which use short-haul microwave facilities for internal use and for running their cellular telephone services. Gibson cited cellular as "the fastest-growing communications business today" and said he is in the process of building a nationwide sales force dedicated to selling exclusively to local phone companies. About 40% of the company's sales are generated by phone companies, private networks and the U.S. government, Gibson said.

But the most lucrative distribution channel for Digital Microwave, and the one which Gibson expects to grow by leaps and bounds, is the company's sales to, and through, long-distance carriers. Last year, more than 50% of Digital Microwave's sales went to Mercury Communications.

Another 10% of sales went to AT&T, which resells Digital Microwave equipment through a private label agreement and uses the gear within its own network. Today, Gibson said, only a small percentage of Digital Microwave equipment is used for bypassing the local phone company, but that is about to change.

Gibson said that, when U.S. District Court Judge Harold Greene recently concluded that bypass is not a threat to the Bell operating companies, he "took the heat off the long-distance carriers" that have wanted to sell private networks to connect customers' premises with the carrier's points of presence.

AT&T's Customer-Provided Access Group, which sells short-haul networks to connect with Accunet Packet Service and other AT&T data services, will start selling bypass alternatives "much more aggressively," Gibson predicted.

Because Mercury and AT&T together provide over 60% of Digital Microwave's annual sales revenue, the loss of either could deal a crippling blow to the company.

Doug Whitman, a senior analyst with Alex. Brown & Sons, Inc., a Baltimore-based investment company, said that is "a legitimate concern, but I think both channels will continue to grow in terms of dollars while declining as a percentage of revenue. Digital Microwave is doing a good job of diversifying and expanding beyond those two channels."

Part of Digital Microwave's expansion plan involves technology transfer agreements with other countries, under which pacts Digital Microwave would manufacture and market some of its equipment internationally. The company signed its first such agreement with Microelectronics Technology, Inc., which will jointly manufacture and market Digital Microwave equipment in the Republic of China.

Gibson said he is working to put Digital Microwave in a "preferential position" in foreign markets as he has done in the U.S. as well.

# ISDN standards

continued from page 9

Once users have decided to become involved, they can provide input through committees such as the T1D1 Technical Subcommittee of the Exchange Carriers Standards Association (ECSA). Committees such as this one address several topics that will have a direct impact on data communications users. For example, network maintenance and management are still being defined. Broadband ISDN is receiving much attention now, and standards work in this area is just beginning.

For information on becoming a standards body participant, interested users may contact ECSA National Headquarters at 5430 Grosvenor Lane, Bethesda, Md. 20814, or call (301) 564-4505.

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>
> **From “Electronic Data Interchange Software Markets, 1987 to 1992”**
> Input, Inc.
> Mountain View, Calif.

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*COMPETITIVE POSITIONING*

## V.32-compatible modems steal market spotlight

**BY PAUL KORZENIOWSKI**
Senior Editor

The market for V.32-compatible modems has attracted the attention of nearly every major modem maker since it burst on the scene a year and a half ago, spurring a pricing war that has cut prices for the 9.6K bit/sec devices from roughly $3,500 to $1,500.

Concord Data Systems, Inc. and Codex Corp. led the market when they unveiled V.32 9.6K bit/sec dial-up modems at the Interface show in March 1986. More than a half-dozen vendors have since followed suit, and now companies are jockeying for position in what has become one of the hottest growth areas in the modem market.

The CCITT V.32 standard specifies use of a special modulation technique, trellis-coded modulation, designed to overcome noise problems with dial-up telephone lines that would otherwise impair data transmission at speeds as high as 9.6K bit/sec.

The pricing war now under way is being fueled by a number of factors. The most obvious is the lack of a clear-cut market leader. Rick Villars, an industry analyst at International Data Corp. (IDC), a market research firm in Framingham, Mass., said AT&T, Racal-Milgo, Inc., Paradyne Corp., Hayes Microcomputer Products, Inc., Cermetek Microelectronics, Inc., Racal-Vadic, Inc. and Universal Data Systems, Inc. have all moved into the market aggressively.

Unlike other segments of the modem market, sales of V.32-compatible modems are increasing rapidly. IDC's Villars said at least 6,000 V.32 modems were purchased in the first six months of 1987, roughly equivalent to the total amount of V.32 modems shipped in 1986.

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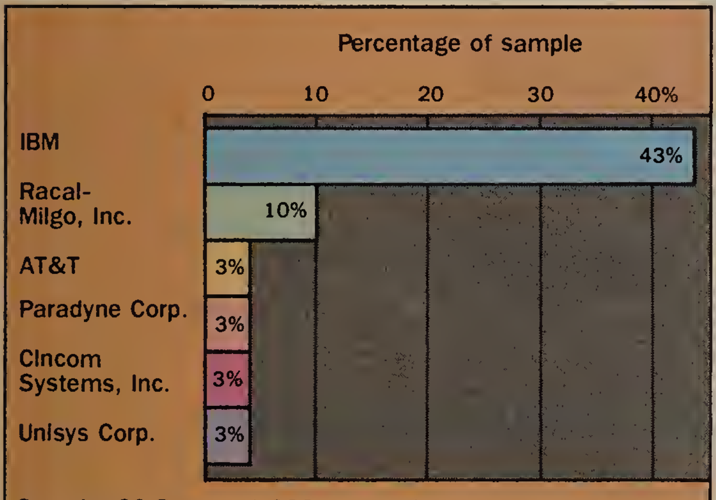
**Companies providing network management systems to the Fortune 1,000**



Sample: 30 Fortune 1,000 companies

SOURCE: FORRESTER RESEARCH, INC., CAMBRIDGE, MASS.

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*INDUSTRY STUDY*

## Stat mux mart loses revenue

**BY PAUL KORZENIOWSKI**
Senior Editor

FRAMINGHAM, Mass. — The emergence of T-1 multiplexers, packet switches and other data communications alternatives has slowed shipment growth of statistical multiplexers and actually caused a decline in revenue for sales of these devices, according to a recent report.

The study, “Trends in the Statistical Multiplexer Marketplace,” published by market research firm International Data Corp. (IDC) in Framingham, Mass., said shipments of statistical multiplexers increased by 3.8% in 1986, but revenue declined by 1.6%. The slowdown is in direct contrast to glowing market projections made in the early 1980s.

Statistical multiplexers, a variation of time-division multiplexers, provide 50% to 100% better throughput than time-division multiplexers because they allocate time slots to attached devices on an as-needed basis, according to the re-

See page 16

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**DATA DIALOGUE**

**MICHAEL LATRIANO**

## Managing with expert systems

*Second in a two-part series on expert systems for network management.*

The Starkeeper Network Troubleshooter is an expert software system developed by AT&T Bell Laboratories to assist in problem isolation and resolution in complex data networks. Its specialty is AT&T's Datakit Virtual Circuit Switch (VCS), which, among other things, handles data communications involving the operations systems of local exchange carriers.

The Starkeeper Network Troubleshooter enables novice network administrators to handle most of the problems in Datakit VCS networks. Those problems would normally be handled by people with much more experience. The designers of Starkeeper hope it will allow customers with large data networks to expand their networks without adding staff. Starkeeper could also help customers with small networks get expert advice that otherwise would be too expensive.

Starkeeper Network Troubleshooter works like a doctor who asks where the pain is and then interprets that information in the context of considerable training.

Some of the most useful information for Starkeeper comes from its software companion, the Starkeeper Network Management System (NMS). Used to monitor and control an entire Datakit VCS network from one location, Starkeeper NMS provides the expert system with numerous trouble reports, maintenance records and other information vital to identifying the cause of a particular problem.

To obtain access to this vital data in a Datakit VCS network, the expert system merely logs on to Starkeeper NMS, as would a human operator. These two systems are very tightly coupled, with about 10% of the expert system software resident within Starkeeper NMS and the remainder located in Starkeeper Network Troubleshooter running on an AT&T 3B2 minicomputer.

AT&T expects to begin testing Starkeeper Network Troubleshooter outside the company by the end of this year. There are many possible uses of the product, including designing a new, optimized network based on its knowledge base as well as performing all of the aforementioned tasks for other networks.

Although Digital Equipment Corp. has yet to introduce artificial intelligence-based network management products, it is an industry leader in AI research and development. The firm is not only developing AI applications, it uses them internally on a daily basis. For example, DEC's Intelligent Systems Technology Group (IST) in Hudson, Mass., is responsible for developing AI applications to help manage planning of internal production and material requirements. Included among IST's three-dozen projects are XCON, XSEL, XSITE, ISA, INET and ILOG. This expert system sextet is designed to automate DEC's sales, engineering, manufacturing and customer service operations.

The most publicized DEC AI application, XCON, helps DEC employees configure VAX and PDP-11 systems according to customer orders. But XCON addresses only one aspect of the implementation cycle. Before a system can be configured, a customer order must be received. Similarly, site planning and design must come before system installation. XSEL and XSITE complement XCON by automating these tasks using expert system technology.

XSEL, an expert sales assistant, helps prospective customers select the DEC computer systems and nets that best suit their needs. While XCON handles the entire job of configuring a VAX from a customer order — that is, batch input — XSEL relies

See page 16

*Latriano is a consultant in the Management Consulting Group at Price Waterhouse in New York.*

# Managing with systems

continued from page 15

on an interactive dialogue to generate a customer order. XSEL prompts the salesperson to supply the prospect's disk, memory, terminal and software requirements. Once this information is loaded into the knowledge base, XSEL evaluates the data, performs substitutions when needed and generates a suggested system order.

When DEC network management AI systems are developed, they should be able to leverage the existing knowledge bases accumulated by other AI systems like XCON and XSEL.

There are always some large, sophisticated network users who cannot, or will not, wait until vendors are ready to make their products generally available. The Travelers Corp., for example, has even taken its internal developments to market to compete with its vendors' products. The Travelers is currently concentrating on expert systems that will enable the network to recover from problems automatically.

Today, the company has a system in operation that helps operators understand and resolve problems by interpreting and translating error codes into usable instructions for the operator. It is likely that once The Travelers has developed network management expert systems incorporating artificial intelligence, they will be marketed through its now profitable subsidiary, Travtech. ◘

# Stat mux revenue

continued from page 15

port. Time-division multiplexers allocate time slots to devices on a fixed, rotating basis, even if there is no data to be transmitted.

Shipments of low-end statistical multiplexers, defined as devices that support fewer than 16 input ports, increased by 3.3% during 1986, and revenue went up by 1.2%.

Micom Systems, Inc. is the market leader, with a 43.3% market share, followed by Codex Corp. with 15.5%, Paradyne Corp. with 5.8%, Timeplex, Inc. with 5.5%, ComDesign, Inc. with 5.4% and Digital Communications Associates, Inc. (DCA) with 4.8%.

Prices in this market segment declined because new competitors such as Multi-Tech Systems, Inc., Gandalf Data, Inc. and Astrocom Corp. introduced low-priced products, forcing market leaders to cut prices or risk losing market share.

Shipments of mid-range products, which support 16 to 64 ports, increased by 5.7%; however, revenue declined by 6.3% due to low-cost products from companies such as Scitec Corp., Gandalf and Racal-Milgo, Inc.

Market leader Timeplex refused to cut its prices, and the company's market share plummeted from 32.3% to 21%. Codex captured 17.9% of the mid-range market and was followed by Tellabs, Inc. with 13.8%, Racal-Milgo with 9.7%, Infotron Systems Corp. with 6.9% and DCA with 5.7%.

Shipments of high-end devices, which support more than 64 channels, declined by 3%, but revenue remained stable.

Vendors were able to raise their prices by adding functions, such as integral modems and routing capabilities. Infotron was the market leader with 38.6%, follwed by Codex with 17.8%, Case Communications, Inc. with 14.5%, DCA with 14.3%, Timeplex with 7.2% and Paradyne with 4.7%.

International sales represents one area in which statistical multiplexer sales are growing. Low-end sales increased by 43.9% and mid-range systems by 38.5%. IDC said it expects international sales to continue increasing at a healthy rate, but that trend will not be enough to offset domestic declines.

The report costs $1,500 and is available from IDC at (617) 872-8200. ◘

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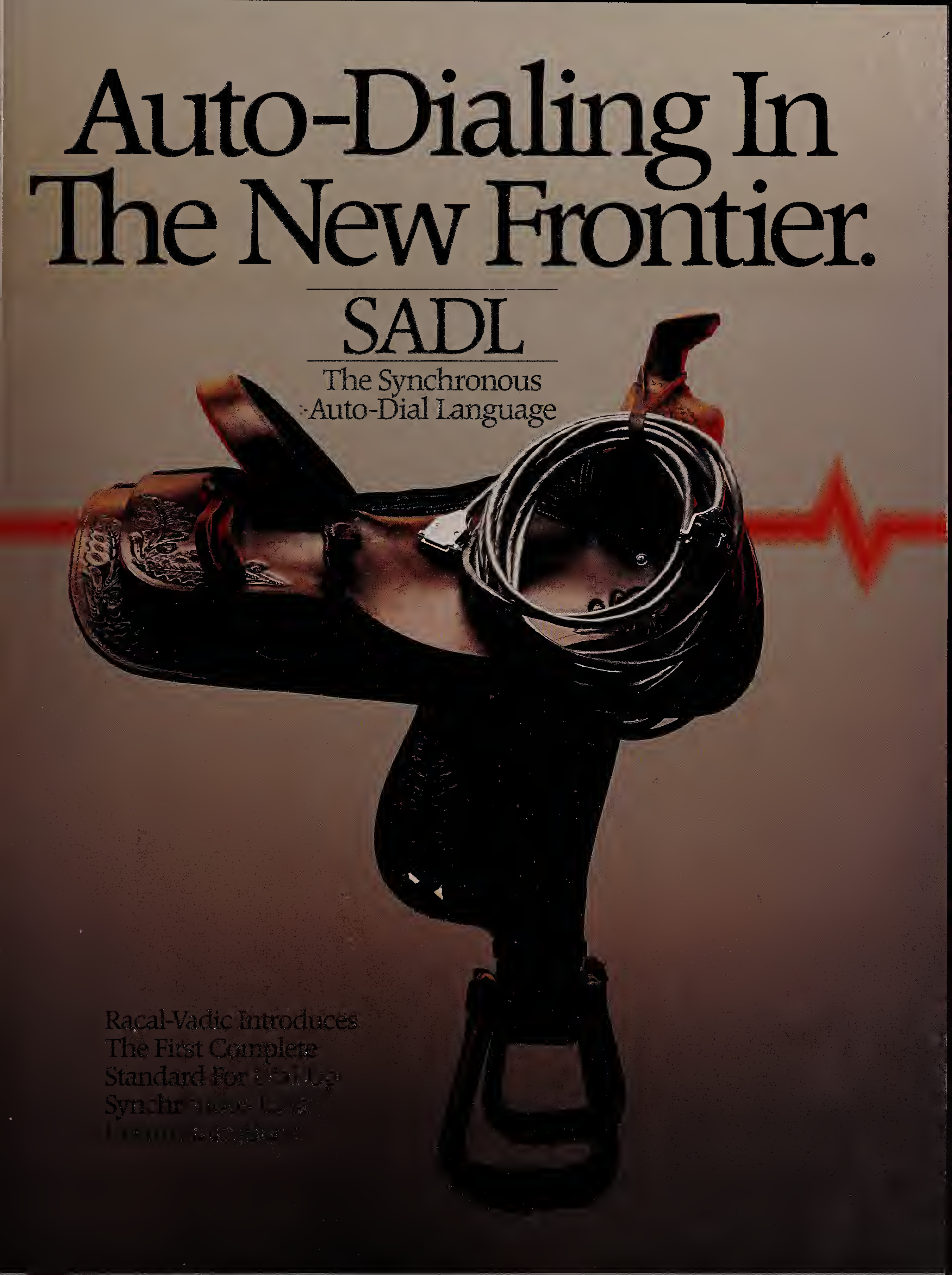
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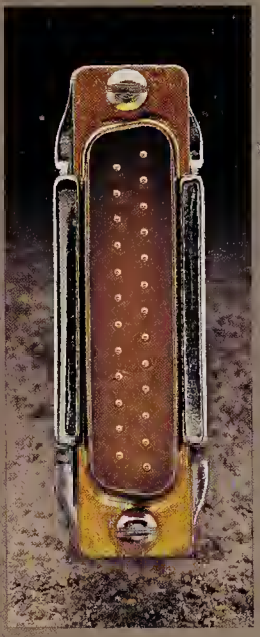
Together they open a whole new frontier of cost savings.



Starting with mainframe hardware. Because now you don't need to pay up to $10,000 for RS-366 ports, or $500 for 801 auxiliary calling units. SADL-equipped modems use inexpensive RS-232 interfaces, and have built-in dialers.

And with SADL, your remote sites can call in on the public switched network—where you only pay for the time you use, and the rates go down with the sun.

## The Auto-Dialing Protocol That Won't Fence You In

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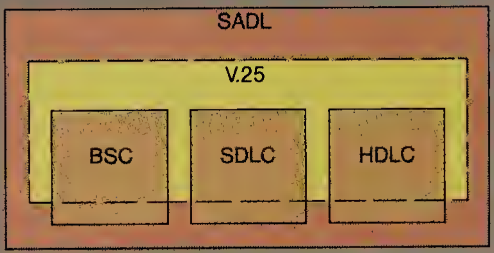

And the CCITT's V.25 *bis* wasn't quite enough. So we enhanced it with SADL, which is modeled after V.25 *bis*, but covers all three synchronous protocols—BSC, SDLC and HDLC. And all the standard dial-up modem specifications, from 2400 to 9600 bps.

Then we field-tested it for almost two years. SADL is long since up-and-running on IBM mainframes under VTAM, IBM Series 1 and System/3X mid-range systems, DEC's VAX, NCR's Tower, Hewlett-Packard's Series 3000, Altos' systems, and the IBM PC.

And now we've released SADL to the public domain, so everybody can get aboard.

## Any Application Sits Pretty When It Rides On SADL

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Such as automated, on-demand remote communications between computers of all sizes. Hot stand-by auto-dial back-up for leased lines. Network diagnostic links. Automated tandem and cross-network dialing. Automatic call reconnection. Sync modem pools on LANs and PBXs. And unattended off-hours dialing for collection of PC files or point-of-sale data.

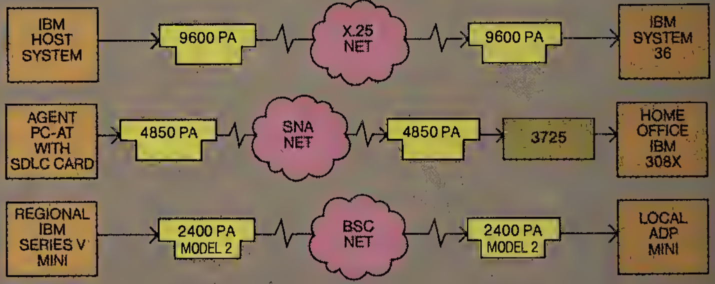
## Riding High In The Fortune 500

SADL has already been pioneered by some pretty impressive customers. And with pretty impressive results.

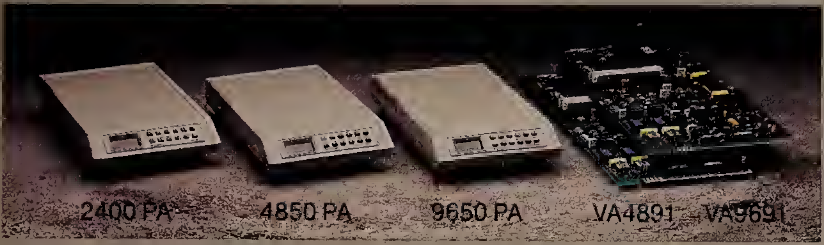
A major American automotive company now exchanges credit information between System/36 computers at their dealerships and headquarters, using SADL-equipped modems and an X.25 packet switching network.

Branch agents at a large insurance company can now directly access the home office's IBM 308X mainframe data base with their PCs, using SADL modems over an SNA/SDLC network.

And at a Canadian parts and inventory operation, SADL-equipped modems eliminated the need for $218,000-worth of RS-366 ports and 801 ACUs on a 400-line BSC dial-up network.



## Remote Site Thoroughbreds And Central Site Workhorses



With a pedigree that goes back almost two decades, today's Racal-Vadic breed includes the finest line of synchronous remote dial-up modems ever developed.

At 2400 bps, there's the V.22 *bis*-compatible 2400 PA Model 2. At 4800 bps, the 208B and V.27 *ter*-compatible 4850 PA, which can also be upgraded to 9600 bps. And at 9600 bps, the V.29 and V.27 *ter*-compatible 9650 PA.

At the central site the 208A/B and V.27 *ter*-compatible VA4891 runs at up to 4800 bps, and the V.29 VA9691 at up to 9600 bps.

More importantly, these are *networking* modems, perfectly suited for centrally-managed dial-up networks.

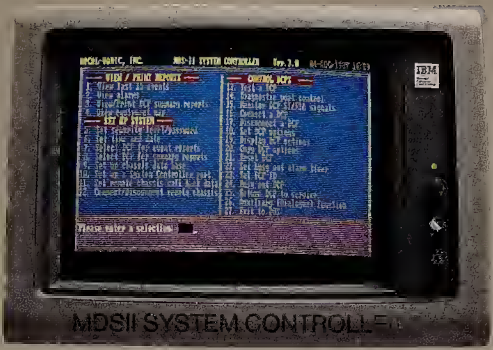
## Riding Herd With A Dial-Up Network Management System

MDS-II is the world's first network management system for dial-up modem networks.

With MDS-II, you can build a network with dozens or even hundreds of modem chassis. You can mix sync and async modems. And thanks to SADL, different dialing protocols, too.

Each MDS-II chassis has space for up to 16 VA4891 and VA9691 modems. Each of these units continuously monitors signal quality and receive-signal levels, and reports all deviations, as well as summary statistics, to the System Controller.

And MDS-II does all this, and more, with an open architecture that won't sacrifice performance today or opportunity tomorrow.

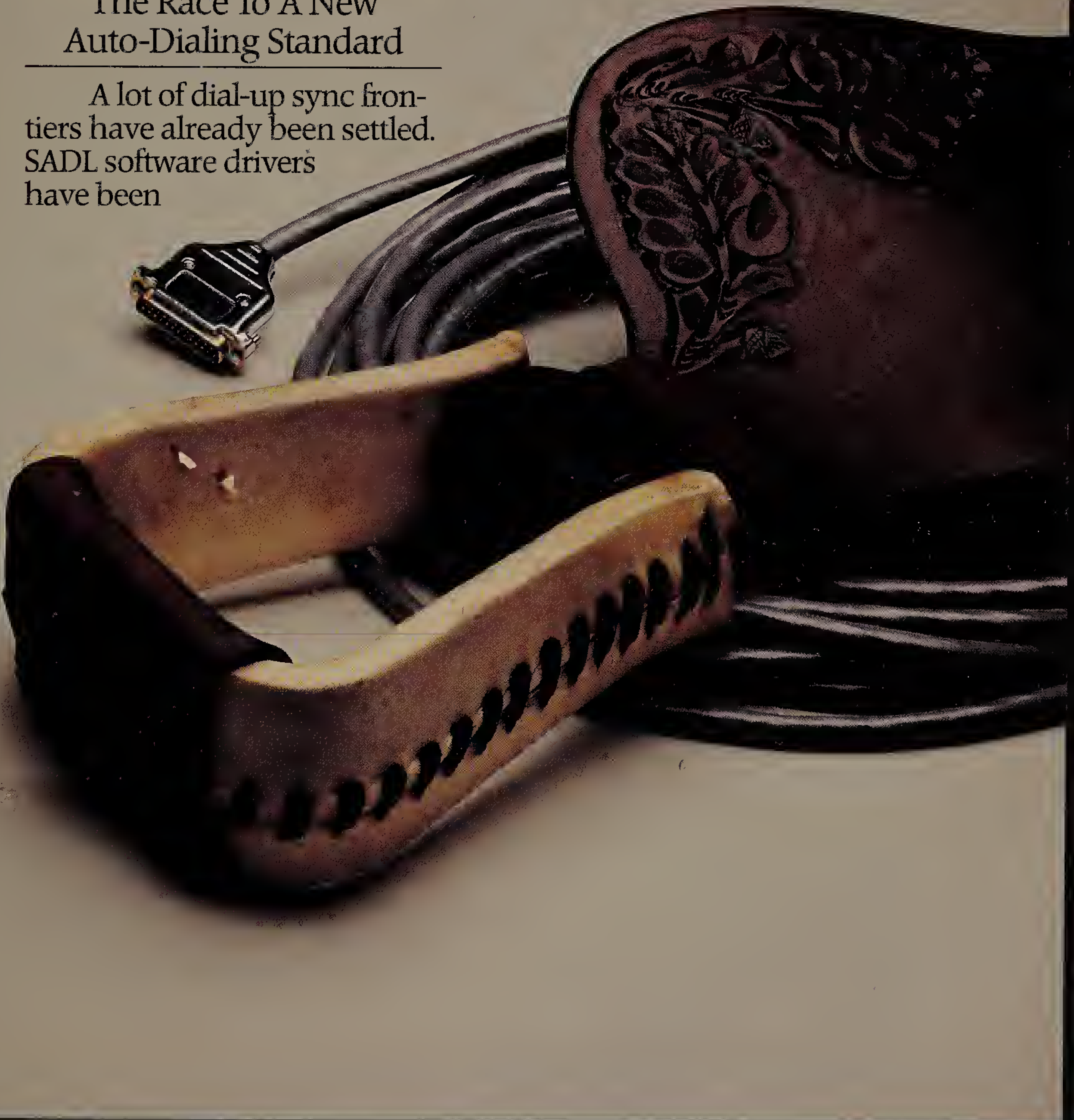


## The Race To A New Auto-Dialing Standard

A lot of dial-up sync frontiers have already been settled. SADL software drivers have been written for hardware systems from IBM, DEC, NCR, Altos, and Prime, to name a few.

SADL-enhanced application software is available from a wide range of vendors: APT Software; AST Research, Inc.; Cleo Software; CQ Computer Communications; IMC; Intrepid Communications; Megadata Corp.; Moisey Systems, LTD.; Network Software Assoc.; On-Line Software International; Pathway Design, Inc.; The Software Group; and Winterhalter, Inc.

And SADL networks are already up and running for a large number of blue chip end users, including Ford Motor Company, Shell Oil, Ralston Purina, General Motors, ADP Dealer and Employer Services, Pizza Hut, Federal Reserve Bank, Tektronix, and GTE Telecom.



# Hitch Up For A Free Ride.

## The SADL Implementation Program

Whether you're a communications programmer in a Fortune 1000 corporation, a third party developer of synchronous emulation products, or anybody else with synchronous dial-up needs, it's easy to jump on the SADL bandwagon.

Because we'll give you a free ride.

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And when you purchase, special price discounts on those same modems.

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Call **800-482-3427** and ask for your free Designer's Guide. Then get on the trail to full SADL implementation.

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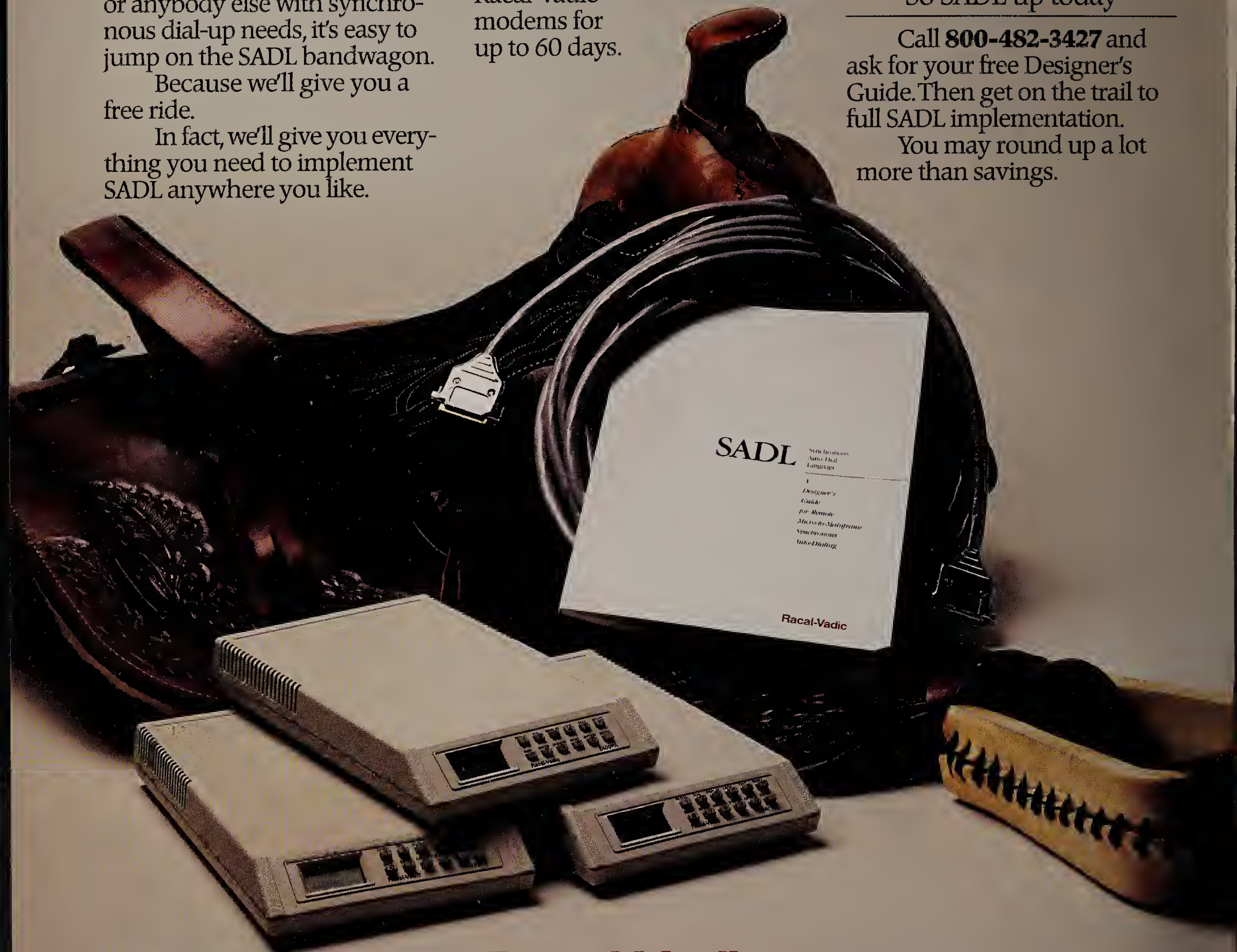

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# TELECOM TRENDS

> “Unfortunately, even the Internal Revenue Service is expanding its purview with telecommunications.
>
> **Prince Dyess**
> Tele-Communications Association chairman
> Telecommunications director
> The Scripps Clinic and Research Foundation
> La Jolla, Calif.

CROSS TALK

**DAVID RUBIN**

## Telephone-based systems can make for a smooth sale

Telecenters, used to support customer service, telemarketing and product cross-selling efforts, are an increasingly important means of providing sales and service information to companies in the financial, airline and retail industries.

Telecenters enable customers to interact with both human agents and automated systems to obtain credit information, mutual fund data and price quotes, make airline reservations and close sundry other types of transactions.

Opportunities exist to improve telephone-based sales and service applications by integrating the operations of telephone and computer systems. The following list shows how telephone-based applications can provide innovative users with significant business advantages over their less aggressive competitors:

- **Providing a customer service representative with information on an incoming call.** Advanced phone systems can capture a customer's account number while that customer is waiting in a queue or prior to the call being answered by a customer service representative. The integrated telephone/computer system can then simultaneously connect the call and provide the service representative with a screen of information on the caller.
- **Achieving lower costs through integrated inbound and outbound operations.** Outbound calling systems support a variety of vendor-initiated campaigns, including payment collection, credit card sales, sales calls to follow up on responses to direct mail and calls to follow up on leads originating as the result of the initial sales call.

Outbound calling systems are computer-controlled and can work in unison with inbound systems. When the inbound call volume drops below a desired level, the computer-controlled system can be programmed to begin placing outbound calls.

- **Streamlining operations and conducting market research.** Starting in 1988, Integrated Services Digital Network Primary Rate Interface services will become available in AT&T's long-distance network. Although ISDN will offer many services, one of particular interest to users is the ability to identify the telephone number of the calling party.

Knowing the telephone number of the calling party can facilitate the creation of systems that call up customer computer data when incoming calls are received, support callback applications and perform market research.

After a call to a telecenter agent is completed, the agent handling the call can enter a code that may be used to identify other products and services the caller may desire. This approach can be used to measure demand for a currently available product or for a product not yet developed.

Obviously, telephone-based sales and service supported by on-line computer applications offer a highly competitive and cost-efficient alternative to face-to-face sales and service. ◻

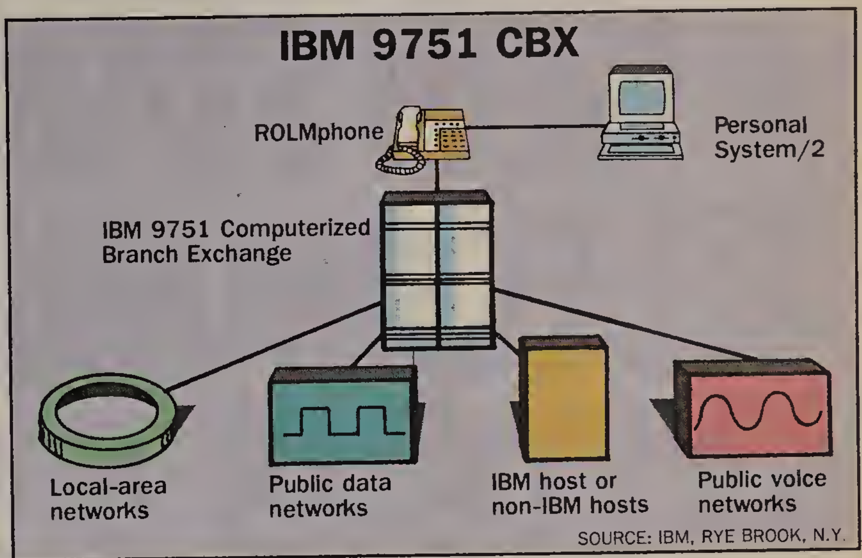
*Rubin is a telecommunications consultant with Arthur D. Little, Inc., a Cambridge, Mass.-based communications consulting and research firm.*

*PRIVATE BRANCH EXCHANGES*

## 9751 will help IBM hold market share

### *But winning new ground is a tough challenge.*

**BY BOB WALLACE**
Senior Editor



SOURCE: IBM, RYE BROOK, N.Y.

The recent introduction of the IBM 9751 CBX will enable IBM to halt the erosion of Rolm Corp.'s private branch exchange market share, but IBM will be hard-pressed to win business from incumbent heavyweights AT&T and Northern Telecom, Inc., PBX industry trackers said last week.

The analysts said, however, that the IBM logo and IBM's reputation as a data processing systems vendor should mean strong sales for the new PBX — which supersedes Rolm's midrange and high-end switch line — to users that have more than occasional data-switching requirements.

Users said they are pleased with the mechanics of the switch, which IBM claims can process 70% more calls than earlier Rolm CBXs, despite the fact that IBM said it will no longer actively market the CBX 8000 and CBX 9000 — a move that has infuriated some users of these switches (“Rolm users question IBM support,” *NW*, Oct. 12).

One PBX industry

See page 18

*DIRECT-DIAL SERVICE*

## MCI wins Defense contract

**BY MICHAEL FAHEY**
Senior Writer

WASHINGTON, D.C. — MCI Communications Corp. recently landed a contract to provide direct-dial long-distance service to the Pentagon and other Department of Defense locations in the Washington, D.C. area.

The contract is for one year, with four additional one-year options. The total value of the contract over the five-year period is estimated at $30 million.

The contract calls for MCI to consolidate existing WATS and foreign exchange services that have been provided jointly by MCI and AT&T.

Under the terms of the contract, MCI must be able to carry four million calling minutes per month and be able to expand its service to up to six million minutes per month.

The contract also calls for MCI to provide 600 fiber-optic access lines between the Defense Department's automatic route selector and MCI's switch in the Washington, D.C. area.

The Department of Defense opened up the contract for competitive bidding in an effort to reduce its long-distance costs, according to a Defense Department spokesman. The MCI service is expected to be 25% to 30% less expensive than current service.

The spokesman said the Defense Telecommunications Service of Washington, which provides telecommunications for Defense Department facilities in the Washington, D.C. area, charges its users for long-distance service. “Our previous service cost somewhere around 17 or 18 cents per minute,” he said.

MCI beat out AT&T, US Sprint Communications Co., ITT Corp., Western Union Corp. and Cable and Wireless North America, Inc. The bidding companies were judged on the basis of cost, company background and technical competency.

“We realized there were a lot of companies that could handle the technical portion,” the spokesman said. “But we did not want to end up with a fly-by-night company, so we made the company's background the second criteria for awarding the contract.”

According to Glenn Powers, senior analyst with Northern Business Information, Inc., a New York-based market research firm, MCI's demonstration that it can meet the Department of Defense's technical requirements bodes well for the carrier in bidding on future government contracts.

“The contract is not an extremely large one by government standards or even for MCI,” Powers said. “But the fact that MCI proved it could meet the technical requirements indicates they can meet the technical requirements for other projects.” ◻

# 9751 will help IBM hold share

continued from page 17

watcher praised IBM for dropping Rolm's antiquated 12-bit voice sampling method, a scheme that creates 96K bit/sec voice channels. The industry standard eight-bit sampling method used in the new switch creates 64K bit/sec channels, the standard used in digital transmission services and one of the basic building blocks of Integrated Services Digital Network.

"This is something that Rolm should have done six or seven years ago," claimed Lee Goeller, author of *Business Communications Review's Manual of PBXs.* "This eight-bit sampling method brings the IBM switch up to where most everyone else's PBXs are. Although dropping the 12-bit sampling technique is a step in the right direction for IBM, whether or not it will put them ahead of their competitors remains to be seen," he said.

Another industry watcher, Spencer Rice, president of S&R Consultants, Ltd., a Madison, N.J.-based communications research and consulting concern, said the switch will enable IBM to hold market share, but the cost of replacing a CBX with the IBM unit may force loyal Rolm users to consider other switch vendors. Rice also noted that the cost of replacement parts for Rolm switches is higher than that of spare PBX parts for the AT&T System 75 and System 85, as well as for the Northern Telecom SL-1 and SL-100.

Barry Marks, vice-president of the Eastern Management Group, a Parsippany, N.J.-based communications research and consulting group, predicted IBM will have some success selling its new switches but will not be able to lure AT&T and Northern Telecom switch users.

"I don't believe IBM will be able to do better than maintain its No. 3 position in the PBX marketplace over the next two years," Marks said. "There will be little shifting during this period. There is nothing about the IBM PBX technically that would allow it to surpass its competitors' switches," Marks maintained.

IBM should focus its marketing efforts on disgruntled Rolm users shopping for a switch change and on users looking for PBXs for new sites, he said.

Although IBM and Rolm have merged their nationwide direct sales and marketing groups, and despite IBM's creation of the Enterprise Marketing Group to target large voice and data communications systems accounts, IBM will experience difficulty selling against vendors that can complement high-end PBXs with larger, central office-type switches.

"AT&T has been aggressively marketing both PBXs and central office switches to large users, as has Northern Telecom," explained Robert LaBlanc, president of Robert E. LaBlanc and Associates, Inc., IBM is the only one of the top three switchmakers that does not currently have a central office switch to offer to its largest accounts, a fact he claimed will likely limit sales of the largest IBM 9751 CBX, the Model 70.

Pratt & Whitney Aircraft Div., The Boeing Co. and the Massachusetts Institute of Technology are among the growing list of large users who have chosen the ATT 5ESS central office switch to anchor their private nets. Others have opted for Northern Telecom's DMS-100.

Several PBX industry watchers claim IBM will be forced to play catch-up with AT&T and Northern Telecom because its high-end switch is late to market. Smaller models of the IBM 9751 CBX, they contend, will also face intense competition from these same competitors.

AT&T and Northern Telecom both recently announced low-end switches, as have Mitel Corp. and Fujitsu Business Communications.

Industry watchers had mixed feelings about IBM's chances of enticing users that want to usze their PBX to support data switching, a switch capability that Intecom, Inc. has marketed successfully.

The IBM 9751 CBX is capable of switching asynchronous data at speeds to 19.2K bit/sec, and synchronous data at a maximum speed of 64K bit/sec. Mike Schumer, vice-president and director of telecommunications research for Gartner Group, Inc., claimed the IBM name will carry much weight with IBM DP shops searching for a PBX. "If anyone can sell data switching through a PBX to users, it is IBM."

Ian Angus, president of Angus TeleManagement Group, Inc., a Toronto-based research and consulting group specializing in PBXs, said a PBX vendor hoping to meet with success in selling PBX data-switching features to users must have data-savvy distribution channels for the switch.

"This is an area in which a superior telecommunications product will go nowhere without high-quality distributors that can sell the PBX's data communications capabilities," Angus said.

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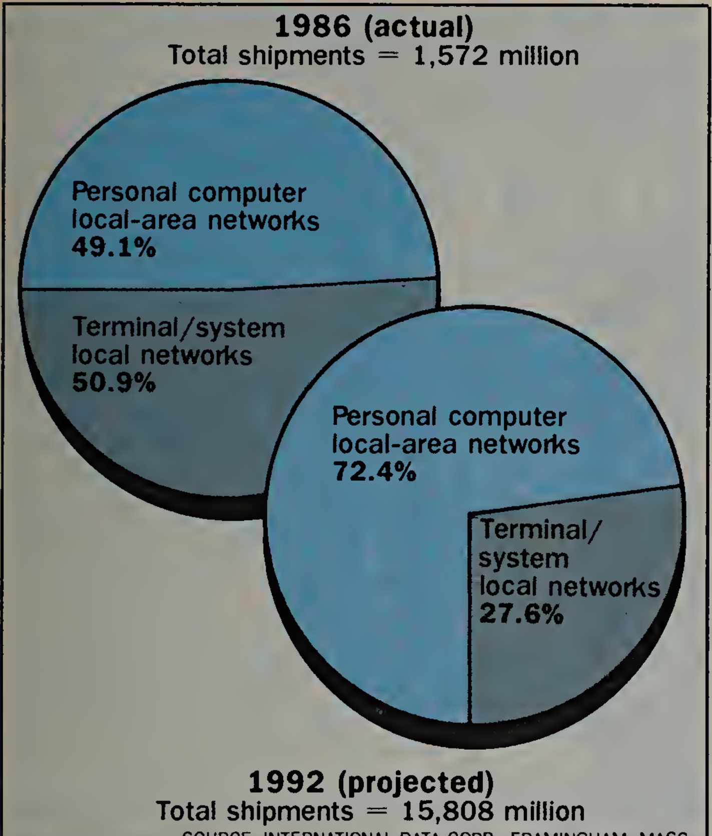
# LOCAL NETWORKING

## When is a standard a standard?

Asked when Digital Equipment Corp. would support IBM-type IEEE 802.5 token-ring local network technology, Robert Murray, division manager for network and communications marketing, said, "We'll support it when it becomes a standard."

**Local net workstation connection shipments for 1986 and 1992**



SOURCE: INTERNATIONAL DATA CORP., FRAMINGHAM, MASS.

*NETWORK MANAGEMENT*

# IBM Token-Ring users get net analysis tool

**BY PAULA MUSICH**
Senior Editor

NEW YORK — IBM recently announced a network monitoring and performance analysis product for its Token-Ring Network, a tool welcomed by customers but criticized by analysts as being useful only for small networks.

The new product, which enables network administrators to trace usage statistics and monitor network performance, was announced here in conjunction with the IBM 9751 CBX. The 9751 is a private branch exchange that supersedes IBM subsidiary Rolm Corp.'s mid- and high-end switches. As announced, the products do not relate to one another.

Although some network diagnostic functions are built into existing IBM Token-Ring adapters, industry observers have criticized the limited network management capabilities available for the Token-Ring Network.

IBM Token-Ring user Travers Waltrip, a vice-president in the data processing department at the Travelers Companies, said he believes the tool is an important addition to IBM's network management facilities. "We needed facilities to view the performance on the ring," he said. "It is a very good first step."

The new tool, a combination of specialized Token-Ring Network interfaces for IBM Personal Computers and companion software, allows network administrators to measure activity on a single ring supporting up to 260 workstations.

The IBM Token-Ring Network Trace and Performance Program is a menu-driven application that analyzes traffic on the network and measures data throughput. It is intended to assist network managers in troubleshooting network problems and isolating faults. The tool only needs to be installed in the network administrator's workstation.

See page 20

## NETWORK NOTES

**Torus Systems, Inc.** of Redwood City, Calif., maker of the icon-based Tapestry network operating system for IBM Network Basic I/O System-compatible local nets, recently announced its first piece of network hardware, an Ethernet adapter. The Torus Ethernet Plus adapter for IBM Personal Computers and compatibles runs Tapestry two to three times faster than other network adapters because of its optimized network driver software, according to the company. The adapter also includes a dual-ported memory buffer that speeds the transfer of data between the adapter and the host personal computer. It is priced at $395 and is available now.

**Bridge Communications, Inc.** of Mountain View, Calif., introduced a high-performance version of its Transmission Control Protocol/Internet Protocol software last week. TCP/IP Connection Service Release 20000 includes a programming language that allows users to customize network interfaces for specialized security and operational requirements. The language allows less technically adept users to automate complex tasks or select options from screen menus. The company said the software provides a 25% performance improvement over its previous version of TCP/IP. The software, which runs on Bridge's CS/1, LS/1, CS/100 and CS/200 communications servers,

See **Network notes** page 20

*PATHWAY DESIGN*

# Micro-to-mainframe line enhanced

**BY PAULA MUSICH**
Senior Editor

NATICK, Mass. — Pathway Design, Inc. unveiled a number of new gateway products and enhancements to its micro-to-mainframe line last week, including a gateway that connects IBM Network Basic I/O System-compatible local networks to IBM hosts and support for IBM Personal System/2 microcomputers based on the IBM microcomputer channel bus.

Coaxgate, a microcomputer-based gateway designed to link NETBIOS-compatible local nets to local IBM cluster controllers and 9370 hosts, greatly expands the number of host sessions previously supported by existing gateways, the company said.

According to Pathway President Robert Broggi, existing gateways only support up to five concurrent sessions, while Coaxgate supports up to 40 sessions over a single coaxial or twisted-pair connection. The gateway supports more sessions through the use of a 20-MHz microprocessor and memory. It is installed in a networked workstation, which, in turn, is connected directly to a 3174 or 3274 cluster controller or to a 9370 host.

The gateway allows each personal computer on the network to run up to five concurrent sessions with the host, not exceeding 40 sessions in total. The gateway provides IBM 3270 distributed-function terminal emulation as well as file transfer for binary- or text-formatted files using Pathway's ftPATH file-transfer utility.

The gateway also supports a hot-key function that allows users to toggle between active MS-DOS and host sessions.

The gateway, which does not have to be dedicated, is available in versions supporting five, 20 and 40 sessions.

A stand-alone version of the product for a single personal computer also supports five sessions. The five-session version is available for $1,595, the 20-session version is priced at $2,595, and the 40-session version is $3,595.

Broggi said that support of IBM's LU 6.2 peer-to-peer protocol in Coaxgate will be available in the first half of 1988.

The Personal System/2 micro-to-mainframe link, pcPATH/MC, connects stand-alone Personal System/2s to IBM hosts over dial-up, point-to-point, leased or multidrop lines. It also supports up to five concurrent host sessions, providing 3270 terminal emulation and file transfer through ftPATH software.

The adapter contains a microprocessor capable of processing asynchronous, Binary Synchronous Communications, Synchronous Data Link Control and High-Level Data Link Control protocols. Pathway communications software available for the adapter supports SDLC and BSC. The maximum line speed is 19.2K bit/sec.

The Personal System/2 micro-to-mainframe link is priced at $990 and will be available next month.

Pathway Design also enhanced its existing netPATH SNA-3270 gateway for NETBIOS-compatible local networks and IBM hosts to support faster response time and additional network management functions.

Version 3.0 of the netPATH gateway, which supports up to 32 concurrent sessions, provides remote communications links between the network and the host.

Network management utilities in the new version include a network supervisor utility, a line-trace facility and a communications event-logging utility.

Version 3.0 is available now in eight-, 16- and 32-session configurations. Prices range from $2,595 to $4,595.

# IBM users get net analysis tool

continued from page 19

The performance function monitors network utilization and provides status information on all connected workstations or a subset of workstations. Network traffic can be monitored selectively according to user-set parameters such as source and destination addresses. The performance function also can be used to display in real time how much bandwidth is being used at any given time as well as the average network-access waiting time.

The trace function analyzes application programs using different protocols, such as Network Basic I/O, on a Token-Ring Network, allowing developers to debug applications for Token-Ring nets.

Trace activity can be triggered by user-specified data patterns or time of day to help isolate faults or gather statistics regarding usage. The trace function analyzes use of data based on time interval, frame size and byte count.

When used in a network that also supports the IBM LAN Manager, an existing network management package, the trace function automatically notifies the LAN Manager that the tracing activity is taking place.

The LAN Manager provides data on network and station status and can be used to perform other network control functions.

Despite the addition of new network management tools, IBM has not offered enough, said Mike Schumer, vice-president and director of local-area communications at Gartner Group, Inc., a market research firm based in Stamford, Conn. "IBM still lags behind in network management capability compared with other local-area network vendors," he said.

"What they announced is adequate for small networks but inadequate for large installations," said Ken Thurber, president of Architecture Technology Corp., a consultancy based in Minneapolis.

"IBM is incrementally adding network management capabilities. Progress has been made, but this is not the do-all and end-all product."

Waltrip said he thinks IBM will announce additional network management tools in support of the Token-Ring and that eventually the new tools will be tied into NetView, IBM's mainframe-based network management software.

"IBM's overall strategy is central-site network management through NetView," he explained. "You've got to assume that the [LAN Manager Program] will be visible to NetView. These tools are components and will be visible to a central site."

The IBM performance monitoring tool is similar to a competing product, the Sniffer protocol analyzer from Network General Corp., in that it interprets information from the network into English. The IBM tool presents information on the probable source of permanent and recoverable errors to the network manager. It also displays traffic statistics in graph and table formats to aid understanding.

Unlike the Sniffer, which bundles network adapters, software and a portable personal computer into a tool costing roughly $23,000, IBM's adapters and software can be installed on workstations on the network.

The IBM Token-Ring Network Trace and Performance Adapter II can be installed in an IBM Personal Computer XT-286, Personal Computer AT or Personal System/2 Model 30. The IBM Token-Ring Network Trace and Performance Adapter/A can be installed in a Personal System/2 Models 50, 60 and 80. Both adapters can serve as Token-Ring adapters when not in trace or performance mode.

The Adapter II is priced at $1,295, the Adapter A is priced at $1,195, and the program, which operates with both, is priced at $295. All three will be available in the first quarter of 1988.

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**Network notes** from **page 19**
can operate over IEEE 802.3, 802.5 and Bridge broadband networks. It is available now and is free to users with previously installed Bridge servers under the firm's software maintenance program.

**Virtual Microsystems, Inc.** last week announced a new release of its network coprocessor, which links IBM Network Basic I/O System-compatible local-area networks with Digital Equipment Corp. VAX minicomputers. The new version allows networked personal computers to concurrently run MS-DOS and VAX applications and interchange VAX and personal computer files. The new version also supports VT200 terminal emulation. The network coprocessor hardware consists of an adapter that fits into the backplane of the VAX. The adapter is also attached to an IBM Personal Computer AT bus expansion chassis.

The new version will be available in November. Host hardware and software range from $10,000 for the MicroVAX to $25,000 for the VAX 8800. The workstation component is priced at $500.

FMC Wanted a Better Private Line Network.

"LDX NET had the Solution."

*"Right from the start LDX NET proved what they could do, and they continue to perform remarkably well,"* reports Bob Mhoon, Manager – Engineering Telecommunications for FMC Corporation, a Fortune 200 Company, and one of the world's leading producers of machinery and chemicals for industry, agriculture and government.

*"When your group is responsible for what ours is, you're looking for more than just a vendor relationship. We were looking for a real partnership, and we found it with LDX NET. My group provides corporate telecommunications services to all FMC operating groups internally, from our host data center here in Dallas, and believe me, we get the personal attention and responsiveness we need from LDX NET,"* said Mr. Mhoon.

As more businesses like FMC are recognizing how managing communications affects their whole company, they're talking to LDX NET. That's because our only business is providing private line services — the key to the integration of voice, data and video telecommunications. And we do it through our own coast to coast network and the most sophisticated means available — fiber optic technology.

*"There's a real feeling of mutual trust with LDX NET. In our experience their service and product is unparalled for reliability. For example, since we installed our LDX NET circuits our error rate has been substantially reduced."*

How would Bob Mhoon summarize his relationship with LDX NET? *"Simple,"* he said. *"LDX NET said 'try us.' We did, and it worked. It's a real pleasure doing business with LDX NET."*

If you're looking for real solutions for your private line network, talk to the people who are the private line specialists — LDX NET.

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Local area networking is evolving fast. And short-term change makes it difficult to build a long-term LAN. But now there's a LAN strategy you can build on. A future-proof strategy for maximum performance *and* across-the-board, heterogeneous connections. A strategy based on standards.

A strategy from Excelan. We're the company that offers more standards, more performance, and more connections than anyone. Because we've been thinking strategically since day one.

**Unshakeable foundations.**

From the outset, Excelan has supported industry standards to provide the broadest range of LAN options. Long before any other LAN company, we focused on TCP/IP, developed it for life in the commercial world and perfected the richest version available. So many companies followed our lead that TCP/IP is now the most widely used protocol for heterogeneous LANs.

We applied the same "standards" strategy to performance and built on Ethernet. Today it's the most popular choice for high performance.

And it doesn't stop there. We're committed to supporting all future standards to ensure that your investment today keeps working for you tomorrow.

**Powerful results.**

This powerful LAN strategy produces unsurpassed performance and possibilities. And a future everyone can build on.

With an Excelan LAN, you move information any way you want — within work groups, departments, and throughout the entire company. Now every part of your company can communicate with every other, from the president's office to marketing to sales to engineering to finance.

And everyone can use every variety of computer their work demands — VAXes, PCs, UNIX micros, minis, Macs and mainframes. Excelan networks handle the broadest range of systems available.

And to cover the full spectrum of your LAN needs, we handle all the de facto standards found in the most popular computer systems. Operating systems such as VMS, System V, XENIX (or any UNIX), PC-DOS, NetWare and Macintosh O/S. Buses such as Multibus, VMEbus, Q-bus, UNIBUS, PC-Bus, and more. Applications standards such as FTP, TELNET, NETBIOS, SMTP and a variety of DFS packages.

**Reliable, right now.**

Excelan has more high performance Ethernet TCP/IP systems at work in the real world than anyone else. We've invested 50 man-years of development work in our software solutions. And because we developed host-integrated solutions from the start, we now have the broadest, most reliable family of high performance LAN products available. Excelan's software forms a solid, reliable framework you can work with today and tomorrow.

**The world to come.**

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# COMMUNICATIONS MANAGER

“Keeping abreast of regulatory and tariff issues that can drastically change the way we do business, while working in a multivendor equipment and service environment, is the overriding issue facing communications managers today.

**Don Gaffney**
President of the Communications Managers Association
Vice-president of communications
Fundamental Information Systems
A subsidiary of Williams Street Brokers
New York

*USERS GROUP PROFILE*

# CCTU, a strong user voice

## *Nonvendor group represents 30 of the largest telecom users.*

**BY MICHAEL FAHEY**
Senior Writer

When the Federal Communications Commission revealed plans this summer to levy local access line charges on enhanced service providers, the Committee of Corporate Telecommunications Users (CCTU) mobilized to oppose the measure and to point out its possible ill effects on private network users.

Since 1975, the CCTU has championed users' interests before the FCC, legislative bodies and state public utility commissions. And the group, which is open to all nonvendor users of communications, represents some powerful users.

According to Kenneth Phillips, chairman of CCTU and vice-president of telecommunications policy at Citicorp, CCTU members currently account for about 10% of AT&T's long-distance revenues. In addition to Citicorp, CCTU's members include Cigna Corp. and New York University.

Over the years, the CCTU has also represented the interests of large and well-known users such as The Hertz Corp., Avis, Inc. and The Prudential Insurance Co. of America. Other members, such as Campaign Communications, Inc. and Grolier, Inc., are less well-known but are large users of telecommunications services.

Kenneth Phillips

“We represent about 30 of the largest telecommunications users,” Phillips said. “But the 30 largest users are not the 30 largest corporations, because you have some operations, such as direct telephone marketing, that are highly automated. They are not very large companies, but they are critically dependent on telecommunications. That is typically the litmus test in terms of who joins.”

CCTU represents users from a wide variety of industries, according to Phillips, who described the diversity of membership as one of the group's strengths.

“There is a fundamental difference, in terms of the regulatory process, between a pleading from a special interest group and one from the CCTU,” Phillips said. “Unlike a pleading from the American Bankers Association or the American Hotel and Motel Association, a pleading from the CCTU cannot be put aside by regulators as representing special interests.”

For the same reason, the group's representation of small, as well as large, companies helps it further user interests, he said. “There is not much sympathy at policy and regulatory bodies for large corpo-

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## DIALOGUE

**Would you consider using a third-party network management service?**

“No, we wouldn't. We have Wang [Laboratories, Inc.] computers and an IBM mainframe, and we're just beginning to work with local networks. We could manage our network that way. We just haven't thought about it.

**Howard W. Ory**
Director of information
resource management
Centers for Disease Control
Atlanta

“We really haven't thought of it. We'd look at it, but we'd need a lot of convincing to rely on outside management at this point in time.

**Roberta Houghton**
Telecommunications analyst
IDS Financial Services, Inc.
Minneapolis

“No, we don't need it. We have our own diagnostic equipment in-house.

**John Wilhouse**
Assistant vice-president
EDP/technical support
Federal Reserve Bank of St. Louis
St. Louis, Mo.

“No, we wouldn't. Our network is not complex enough to justify using such a service.

**James Hite**
Director of technical
support and operations
L'Eggs Products
Winston-Salem, N.C.

GUIDELINES

**ERIC SCHMALL**

# Managers have nothing to fear but fear itself

The private branch exchange you just installed fails repeatedly. The network you designed runs out of bandwidth two years sooner than you predicted. The 250 personal computers about to be delivered contain a fundamental protocol incompatibility with the rest of your network. The manufacturer of the 500 modems you recommended just filed for Chapter 11.

Specters of failure swirl in communications managers' minds. These harpies of fear swoop down on managers' self-confidence and ruin any appetite they once had for change or innovation. The only way to exorcise these demons is to confront them.

The possibility of failure certainly abounds in this profession. Still, the manager has to learn to adapt to this ever-present threat without becoming immobilized by its potential power. Managers must realize that mistakes and how they are dealt with are also responsible for success.

There is no royal road to telecom expertise.

Learning the ropes in this discipline is, admittedly, no simple task. There is no royal road toward telecommunications expertise. But the accumulation of experience is not as perilous as in other professions. Someone once asked a parachuting instructor what the most difficult thing about parachuting was. After some reflection, the instructor replied, “I guess it's that you've got to get it right the first time.”

Fortunately, within the communications profession there are learning steps — and missteps — that provide a more gradual building of competence, without the danger of early career mortality.

Failure represents the dark side of risk. The communications industry has done little

See page 27

*Schmall is network systems manager for an insurance holding company.*

## BOOK REVIEWS

*The Frontiers of Management: Where Tomorrow's Decisions Are Being Shaped Today*, by Peter F. Drucker (Harper & Row Publishers, Inc.), $8.95.

*The Frontiers of Management*, a compilation of 35 Peter Drucker essays and articles published in *The Wall Street Journal* and elsewhere, serves up bits and pieces of the highly touted management writer's thinking on economics, corporate organization and managerial staffs.

Operating on the idea that today's managers are building the future just by making their daily business decisions, Drucker offers advice on topics such as slimming middle management, filling jobs with the right people, measuring white-collar productivity and labor relations.

In this, his 22nd book, Drucker expounds his philosophies on economics (“Economists never know anything until 20 years later.”); people (“There is no such thing as an infallible judge of people, at least not on this side of the Pearly Gates.”); management (“Management as a discipline and as a practice deals with human and social values.”); and corporate organization (“Once a company ceases to attract and to hold competent people, dry rot has set in.”).

Without falling off the visionary bandwagon he has built for himself, Drucker's afterword, which

See **Book review** page 26

# ASSOCIATIONS

**The International Communications Association (ICA)** will hold its 1988 Interim Seminar Jan. 31 to Feb. 3 in San Francisco. The theme of the seminar will be "Telecommunications for the '90s and Beyond." Topics to be covered at the seminar include: artificial intelligence, advanced voice applications from a management perspective and a technology forecast for the future.

The seminar is geared toward ICA member companies who are actively planning their future telecommunications strategies, according to the ICA. The Interim Seminar will not be "the usual show-and-tell technical presentation." Instead, the ICA said, the seminar is directed at communications managers who are working to develop long-term strategic plans.

The **ICA** will also sponsor a World Telecommunications Seminar in Geneva, Switzerland, on March 29 through 31. Topics covered at the seminar will include standards and regulatory issues from European, Far Eastern, UK and U.S. perspectives.

The **ICA** also announced it has hired Robert Kingsbury as its new executive director.

Kingsbury, who is a graduate of the University of Missouri, previously served as the associate athletic director for external affairs at Southern Methodist University in Dallas.

One of Kingsbury's major tasks will be to work with the ICA's board of directors to expand the group's member services, according Robert Eilers, ICA manager of publications.

"The member services committee is looking for ways to promote increased contact between members," Eilers said. According to Eilers, ICA members meet throughout the year, but for many, contact with other group members is limited to the group's annual meeting and interim seminars.

**Book review** from page 25

he wrote especially for the book, comments on management as the "agent of social innovation."

The writing is tight, lucid and easily digested. The brevity with which the topics are handled serves to pique the reader's interest in a number of the ideas espoused.

The advice offered is thoughtful and practical — the book is something like a handbook that can be used in solving management ailments.

Best described as a Drucker primer, the book will give some readers all they want of this futurist's writings, but will leave many wanting more.

— *Mary Linehan*

## CCTU

continued from page 25

rations complaining about the telephone bill," Phillips said. "But when small companies in remote areas of the country are in danger of going out of business because of changes in rates and tariffs or the policy side of telecommunications, there is more sympathy."

In many ways, according to Phillips, CCTU is similar to the Ad Hoc Telecommunications Users Committee in that it lobbies and promotes the interests of large telecommunications users. The Ad Hoc Committee, however, Phillips said, represents large industrial companies such as Westinghouse Electric Corp. and General Electric Co., while the CCTU is oriented more toward service-sector companies.

The CCTU, Phillips said, offers two types of service to members: ongoing and and case-connected.

As part of its ongoing services, CCTU keeps members informed about legislative and rate-making activities that will affect their budgets and strategic planning.

Case-related activity, Phillips said, is entirely voluntary and calls for the group to represent specific participating members before rate- and policy-making bodies.

As cases arise, independent financial war chests are established for them, according to Phillips.

CCTU is represented by the New York-based law firm of Reid & Priest, which coordinates the group's congressional lobbying efforts. In addition, the CCTU employs the law firms of Weil, Gotshall & Manages in New York and Morrison and Foerster in Washington, D.C. and California. The CCTU also commissions economic impact studies on communications issues. "We do very objective policy analysis," Phillips said. "We do have one bias, and that is that we represent large users."

The CCTU is working against a measure being considered by the congressional Joint Committee on Taxation and the House Ways and Means Committee that would levy a 10% tax on private network equipment ("Congress ponders tax on equipment," *NW*, Oct. 12). The group was involved in a successful fight to rescind a similar levy in New York state.

When connecting different communications systems, it's best to put all your eggs in one basket.

*Odyssey: Pepsi to Apple . . . A journey of adventure, ideas and the future*, by John Sculley with John A. Byrne (Harper & Row Publishers, Inc.), $21.95.

*Odyssey*, which recounts Apple Computer, Inc. Chief Executive Officer John Sculley's journey from the staid PepsiCo, Inc. to the heart of California's Silicon Valley, provides an informative and entertaining glimpse into the life of a corporate heavy hitter.

From management trainee to president of PepsiCo, Sculley's account of his 16 years on the PepsiCo fast track is fun reading, but the pace doesn't really pick up until the visionary computer company begins wooing Sculley.

The chase goes on until Apple cofounder Steven Jobs, who had become a close friend of Sculley's, asks him, "Do you want to spend the rest of your life selling sugared water, or do you want the chance to change the world?" Sculley was named CEO of Apple in May of 1983.

The tempo of the book picks up to an almost frenetic pace in telling the story of Sculley's first year and a half at Apple, the firm's near-collapse in 1985 and the power struggle between Sculley and Jobs that culminated in Jobs' being forced out of the company.

### Lessons to be learned

Although the dialogue seems contrived, the book makes for good reading. Each chapter concludes with an essay — Sculley calls them tutorials — that sums up the management or marketing lesson that can be drawn from that particular chapter.

Following the chapter that tells of his own resignation from PepsiCo, Sculley writes on loyalty and its changing place in industry. After the chapter on the firing of Jobs from Apple, he outlines his strategy for managing in a crisis.

Co-written with John Byrne, management editor of *Business Week*, the book combines the drama of Sculley's corporate life with management and marketing advice to create an anecdotal reference book.

— *Mary Linehan*

AT&T's Premises Distribution System: Making it easy to make all the right connections.

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The advantage of flexibility—PDS makes it easy to use the best product for different functions. You're not locked into a single vendor's technology. And PDS will support voice and data transmission, as well as image, digitized video, and other forms of communication.

The advantage of expandability—PDS allows users to connect equipment through universal jacks that fit standard wall outlets.

**The "AT&T" advantage.**
PDS is backed by a comprehensive range of consulting, design, engineering, and service support to ensure the system meets current and future communications needs. Our Application Assurance Program is a commitment that your PDS will support certified applications for a full five years.

So give us a call at 1 800 372-2447, or mail the coupon, or contact your authorized PDS distributor. If you've got questions about connecting your communications products, we've got a basket full of answers.

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AT&T's PDS is a comprehensive system of basic components, from inside wire (both copper and fiber), to electronic apparatus and support services.

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## Nothing to fear but fear itself

continued from page 25

but increase that risk for communications managers over the last 10 years.

So many new factors have entered the general equation; new technologies, contending protocols and pit bull-like competition among a bewildering array of market entities all combine to make decision makers quake.

It is now possible to make mistakes of magnitudes and proportions unheard of in this industry in the recent past.

Small wonder, then, that managers yearn for the old days when there was only one carrier, one manufacturer and narrowly limited options.

Today, that wish manifests itself in the cry for standards, turnkey systems and end-to-end responsibility for networks. In the absence of these solutions, many managers drift into a catatonic state of indecision. Instead of being advocates for change and innovation, communications professionals become chief obstacles to implementing new technology.

Without trivializing this grim concept of failure, one has to acknowledge that no progress can be made without stepping up to risks, accepting failures when they occur and then moving on. William Smithburg, chairman of Quaker Oats Co., once remarked, "[Failure] is like learning how to ski. If you're not falling down, you're not learning."

> Many managers drift into a catatonic state of indecision. Instead of being advocates for innovation, they become chief obstacles to implementing technology.

Managers have the additional responsibility of establishing a fault-tolerant atmosphere for their staff. Such environments would be attainable only if certain conditions were met. Primary among them would be the general recognition that failures will occur as part of the course of being human.

Closely allied to that assertion, however, should be the stern expectation that learning from mistakes will make the unit stronger, wiser and less vulnerable to certain categories of error. Another provision should require everyone to compose and assess his own failure inventory and to look for patterns. Are people truly learning from their past or are they victims of recurring mistakes? The answers to such questions will yield some valuable insights into how the organization might improve.

By recognizing the risk, accepting the inevitability of some failure and consciously integrating the experience of past mistakes into the fabric of future decisions, the manager will lay to rest the fear of failure that otherwise might cripple his effectiveness in the organization.

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And it's compatible with other vendors' equipment, through industry standard protocols and interfaces.

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Corporate America is asking for custom hybrid networks, and Northern Telecom is responding as the leading supplier to their systems integrators.

Meridian Customer Defined Networking contains three important innovations:

Meridian Network Services,* applications which include corporate carrier services, advanced calling features, local area networking, conferencing, voice mail and other advanced networking services.

Meridian Network Control,* management tools for network planning and design, operations, administration and diagnostics for hybrid networks. It also interfaces with management and administration data bases offered by other vendors.

And Meridian SuperNode,* a powerful new fault-tolerant network node that gives corporations with large, complex networks the same capabilities we provided to local and interexchange carriers with the introduction last July of DMS SuperNode.*

These innovations, combined with the intelligence of Signaling System 7 protocol for very large networks, ISDN primary and basic rate access, and T1 bandwidth management, will free corporations from the boundaries of traditional network architectures.

Best of all, Meridian Customer Defined Networking is a reality. It's available now.

Meridian Customer Defined Networking exemplifies Northern Telecom's commitment to OPEN World* and open networks.

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# NEW PRODUCTS AND SERVICES

See inside for:
▶RCA telex links, fax service
▶FileNet image storage products
▶Case DCX enhancements, modem

*NSA*

## Software eases PC-to-PC links

*Async/APPC ties PCs via IBM's APPC.*

**BY JIM BROWN**
New Products Editor

LAGUNA HILLS, Calif. — Network Software Associates, Inc. (NSA) recently announced software that enables personal computer applications to access applications on other micros using an asynchronous serial port and IBM's Advanced Program-to-Program Communications.

NSA's Async/APPC uses IBM's suite of peer-to-peer LU 6.2 programming verbs, which establish interactive connections between applications running on different computers.

Currently available LU 6.2-based micro-to-micro software products require synchronous communications, meaning the personal computers must be outfitted with terminal-emulation boards that support IBM's Synchronous Data Link Control protocol and synchronous modems.

### Tool kit

An Application Subsystem Interface and System Tutorial (ASSIST) development tool kit supplied with Async/APPC is used to implement the suite of LU 6.2 programming verbs that enable an APPC application on one device to communicate with a partner APPC program running on another.

Async/APPC is also capable of supporting APPC applications developed with other NSA LU 6.2 packages, including AdaptSNA LU 6.2/APPC and Adapt3274 LU 6.2/APPC.

AdaptSNA LU 6.2/APPC enables a personal computer- or IBM Personal System/2-based APPC application to communicate with an APPC application residing on a minicomputer or mainframe by means of an SDLC link.

Adapt3274 LU 6.2/APPC enables personal computers or IBM Personal System/2s linked to an IBM 3174 or 3274 terminal controller to communicate in the same manner.

Async/APPC now allows a personal computer or Personal System/2 to use the APPC applications developed with AdaptSNA LU 6.2/APPC or Adapt3274 LU 6.2/APPC when communicating with another personal computer or Personal System/2.

### Pricing

Async/APPC, which includes ASSIST software, will be available in December for $285.

Network Software Associates, Inc. is located at 22982 Mill Creek, Laguna Hills, Calif. 92653, or call (714) 768-4013.

*MARKET EXPANSION*

## Tekelec unveils portable test devices

**BY MARY PETROSKY**
West Coast Correspondent

CALABASAS, Calif. — Looking to expand into the end-user marketplace, Tekelec recently introduced portable devices for testing T-1 lines and microwave systems.

Tekelec has traditionally sold its test equipment to telephone companies and suppliers of digital transmission equipment, according to Joseph Noble, vice-president of sales. Now the company has aimed several new products at user companies with in-house telecommunications operations.

The TE8000, a digital voice test system, is the first in a new family of products designed to test T-1 facilities, Noble said. The unit is designed for network monitoring, diagnostics, maintenance and repair. Similarly, the TE1000, which Tekelec is licensing from British Telecommunications plc, is the first microwave tester of its kind, Nobel said. The TE1000 is designed to test digital radios by simulating multipath distortion of microwave signals.

Based on the Motorola, Inc. 68000 microprocessor, the TE8000 features the MTOS multitasking operating system Tekelec uses on its line of protocol analyzers. With its multitasking capabilities, the TE8000 can monitor all 24 channels of a T-1 line, and it can access signaling bits. The TE8000 also allows users to drop out one channel in order to insert a test pattern. Up to seven different measurements can be displayed simultaneously on the TE8000's full-sized CRT screen.

Analog line measurements include received clock frequency and loop current measurements. Digital measurements include bit-error rate, errored seconds and indivdual errors.

The TE8000 supports three formats — superframe, extended superframe and unframed formats — and a variety of industry standard coding, including AMI, B8ZS and ZCS(B7). The device can automatically determine which format is being used.

Tekelec designed the TE8000 to make it user-friendly, Noble said. The system is menu-driven and features function keys. In addition, users can set up tests in advance and store test parameters so that technicians in the field can readily execute appropriate tests. The portable TE8000 weighs 17 pounds. Slated for delivery in the first quarter, the TE8000 is priced from $5,000 to $10,000, depending upon configuration.

Users can employ the TE1000 to test digital radios before installing them and to simulate multipath conditions in order to align microwave antennas properly. Multipath problems, such as rainstorms and clouds, can cause stray signals from a microwave beam to be reflected into a receiver. Because these signals generally travel a longer distance than the main beam, they can interfere with the main beam and cause data distortion.

Previously, multipath distortion was simulated with the use of cumbersome equipment, according to Ken Molloy, vice-president for engineering, pulse code modulation products. The TE1000 not only offers users a way to test their microwave networks, but it also offers microwave vendors a way to test their products more quickly. By speeding up the testing cycle, vendors will be able to achieve more rapid improvements in digital radio technology, Molloy said.

The TE1000 will be available in the first quarter of 1988 and is expected to sell for $32,500.

*DCA*

## Irmacom PC adapter enhanced

**BY JIM BROWN**
New Products Editor

ALPHARETTA, Ga. — Digital Communications Associates, Inc. (DCA) recently enhanced its Irmacom remote communications adapter to make it more compatible with existing Irma micro-to-mainframe emulation boards used in local environments.

Irmacom2 consists of a board and software and enables a remote IBM Personal Computer or Personal System/2 Model 30 to access an IBM mainframe synchronously. The device enables the micro to emulate an IBM 3278 or 3279 terminal and appears to the host as a remote IBM 3274 terminal controller. Irmacom2 also enables a personal computer-attached printer to appear to the host as if it were an IBM 3287 printer.

The redesigned personal computer board occupies a half-card slot and formats screens like other Irma products. Irmacom2 can also be configured to operate on extended memory boards, which are used to extend a personal computer's random-access memory beyond 640K bytes. It also supports DCA's High Level Language Application Program Interface, which enables a programmer to create interactive applications between the host and a Personal Computer operating in emulation mode.

Irmacom2 will now support a 132-column by 27-line display screen, DCA's ForteNet high-speed file-transfer software and a set of optional C subroutines, which enable user-written personal computer programs to access the Irmacom2 board.

Irmacom2 enables the personal computer to support up to five concurrent host sessions. A hot key is used to toggle between those sessions. The package is also compatible with DCA's mainframe-resident Irmalink FT/TSO and FT/CMS file-transfer software, as well as IBM's 3270 personal computer file-transfer software. Priced at $895, versions of Irmacom2 supporting IBM Systems Network Architecture or Binary Synchronous Communications protocols are available. An upgrade from existing Irmacom or ForteLink SNA products to Irmacom2 will cost $395.

DCA is located at 1000 Alderman Drive, Alpharetta, Ga. 30201, or call (404) 442-4000.

# First Look

## Software links PCs to image storage system

**FileNet Corp.** released software that enables personal computers to access document images stored on its optical storage and retrieval (OSAR) units and hardware and software that link separate FileNet systems to a wide-area network.

**PC Connection** enables IBM Personal Computer ATs and Intel Corp. 80386-based personal computers equipped with a graphics adapter board and linked to an Ethernet local-area network running FileNet's WorkFlo network software to retrieve documents and images from 12-in. optical disks used in FileNet. In addition, the software enables graphics and text created on a personal computer to be stored on a FileNet OSAR unit.

Previously, only FileNet workstations were able to access stored documents.

A family of **Wide Area Image Communications and System Networking** communications boards and software link remote FileNet systems via leased or dial-up lines at speeds up to 56K bit/sec.

An **Image Remote Job Entry** facility enables remote FileNets to accumulate documents and transmit them to a central site in batch mode.

An **On-line** communications facility enables users to access stored images located on remote FileNets as if they were directly connected to it.

Priced at $1,000, PC Connection will be available in the second quarter of 1988. Versions supporting IBM's Personal Computer XT and Personal System/2 will be available in the second half of 1988.

The networking products are priced from $32,000 and will be available in the second quarter of 1988.

*FileNet Corp., 3530 Hyland Ave., Costa Mesa, Calif. 92626, or call (714) 966-2344.*

## RCA introduces links, fax service and gateway

**RCA Global Communications, Inc.** released a modem and software that enables personal computers using its communications network to link to telex facilities, as well as a new international facsimile distribution service. In addition, the firm announced that Boston users will be able to dial a local telephone number to access its Digital Access Network, which gateways to RCA's International Business Satellite services.

**PC Link** enables personal computers to send or receive telex messages via RCA's GlobeLink service. PC Link consists of an external autoanswer modem, operating at up to 1,200 bit/sec, and software. The modem supports a 256K-byte buffer, which receives and stores incoming telex messages until the user loads them to the personal computer and holds outgoing telexes until they can be transmitted. Telex messages stored in the modem can also be directed via an auxiliary port to a printer. The modem is supplied with a five-hour battery backup power module.

**PC Link Plus** software enables an IBM Personal Computer to send or receive telex messages in background mode while it processes another application. The package can also be configured to support unattended telex operation and interactive-type telex transmission. PC Link Plus supports full text-editing features, a menu of options, logs of incoming and outgoing messages with status notes and directories of individual and broadcast telexes.

**PC Link Plus Banker** software works in conjunction with PC Link Plus to support electronic funds transfer via telex services from an IBM Personal Computer. RCA said the package offers banks security features, the ability to support an unlimited number of authorization levels in order to restrict access, data encryption and built-in test keys. PC Link Plus Banker is also said to support the International Standards Organization's international standard for electronic funds transfer via telex.

RCA's **FaxForward** international facsimile transmission service will enable users to upload a facsimile to RCA's communications network and have that facsimile broadcast to multiple international locations. The service will continue transmitting the facsimile until delivered and enables the user to specify delivery time. It will also supply usage reports and notify the sender when the facsimile was delivered. RCA said FaxForward meets the CCITT X.400 protocol for message handling. FaxForward began delivering facsimiles to locations in Japan last month and is expected to expand to other countries in 1988.

PC Link modem is priced at $390, and the necessary software costs $49.95. PC Link Plus costs $295 and requires a minimum of two disk drives, 192K bytes of random-access memory and a Hayes

See **RCA** page 34

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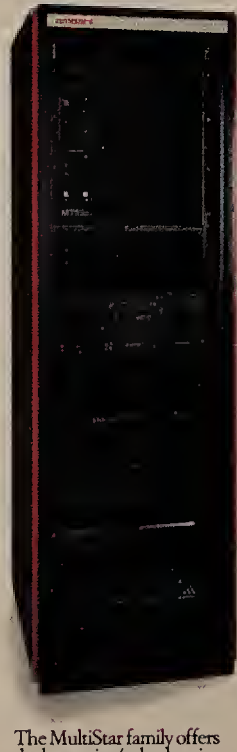

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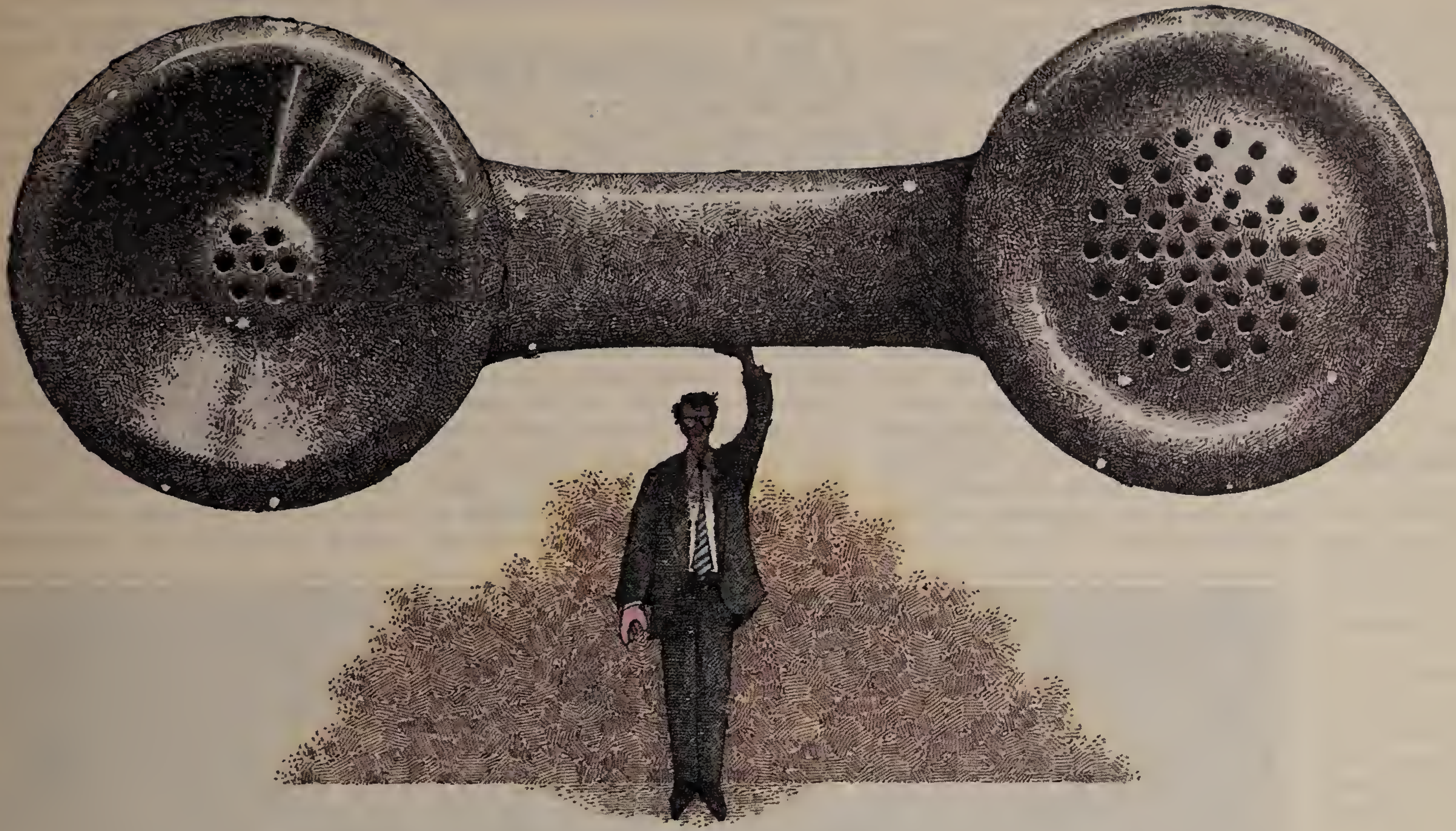

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**RCA** from **page 32**

Microcomputer Products, Inc.-compatible modem operating at up to 1,200 bit/sec. Pricing for PC Link Plus Banker has not yet been set, according to the vendor. Rates for the FaxForward service are expected to be up to 40% lower than directly dialed international voice rates.

*RCA Global Communications, Inc., 201 Centennial Ave., Piscataway, N.J. 08854, or call (201) 885-2307.*

### Software links DEC VAX to data base machine

**Teradata Corp.** announced software enabling Digital Equipment Corp. VAX systems to access directly its DBC/1012 Data Base Computer System via an Ethernet local-area network.

Teradata's **VAX Interface** runs on any VAX processor supporting the VMS or MicroVMS operating system Release 4.4 or higher. The package consists of two modules, the Basic Teradata Query (BTEQ) facility and Teradata Director Program (TDP) system interface.

With BTEQ, VAX users are able to compile SQL-based requests for data residing on the DBC/1012 in either a batch mode or interactive fashion.

The TDP directs that request to the DBC/1012 via existing Ethernet networks supporting the Transmission Control Protocol/Internet Protocol or International Standards Organization's Open Systems Interconnect model. BTEQ receives data returned from the DBC/1012 and formats it for use on the VAX.

Scheduled for December shipment, versions of the package will be available for the VAX 11/700 product line, VAX 8000 series, MicroVAX II, VAXstation configurations and the newly announced 3500 and 3600.

Versions running on the VAX 8000 series will be $10,000. Versions for other VAX systems will cost $4,000. Lease and rental options are available.

*Teradata Corp., 12945 Jefferson Blvd., P.O. Box 92117, Los Angeles, Calif. 90009, or call (213) 827-8777.*

### Terminal server supports access to IEEE 802.3 nets

**Develcon, Inc.** announced a 64-channel terminal server for its DevelNet data-switching system.

The product enables attached host ports, personal computers, asynchronous terminals and other peripherals to access IEEE 802.3-compatible local networks operating under the Transmission Control Protocol/Internet Protocol. Users linked to the server are able to select and contend for any resource on the IEEE 802.3 net.

The server supports eight card slots, each of which accommodates up to eight devices. Each server-attached device must provide a password to access DevelNet. Unused card slots can support other DevelNet interfaces and gateways.

Prices for the 64-channel terminal server start at $20,000. An option will support redundant power and logic.

*Develcon, Inc., 6701 Sierra Court, Dublin, Calif. 94568, or call (415) 829-6200.*

### Case releases DCX port, board, upgrade kit, modem

**Case Communications, Inc.** released a port board for its Data Concentrating Exchange (DCX) switching statistical multiplexer that can be software-configured, and the company announced a board that can upgrade one DCX model to another. The firm also unveiled a 4.8K bit/sec synchronous modem.

Case's Motorola, Inc. 68000 microprocessor-based **Soft Channel Card (SC-1)** replaces previous DCX Low Speed Card port boards, which had to be pulled from the DCX and configured via dip switches. Each of the four ports on a SC-1 board can be configured by any terminal linked to it or from the DCX front panel. Optionally, preset configuration data can be loaded to the board via a printed bar-coded strip and a bar-code reader. The board can be configured to enable an even parity device to communicate with an odd parity device. The firm's **User Switching Option 25 (USO25)** is used to upgrade a DCX 840 model to a DCX 850. The USO25 board will be standard on all new DCX 850 systems. The DCX 850 offers network switching, routing, rerouting, contention, network statistics and supports up to 63 interconnected nodes, each of which can support up to 255 ports.

The firm's **208A/B Modem** supports full-duplex transmission via leased lines or half-duplex transmission via either leased or dial-up lines. It is used in point-to-point and multipoint environments. According to the vendor, a Case DB1 or T48 Dial Back-up Unit can be used to provide a full-duplex backup transmission path via dial-up facilities in case of a leased-line failure. The unit can also work with a Case or Bell 801 Automatic

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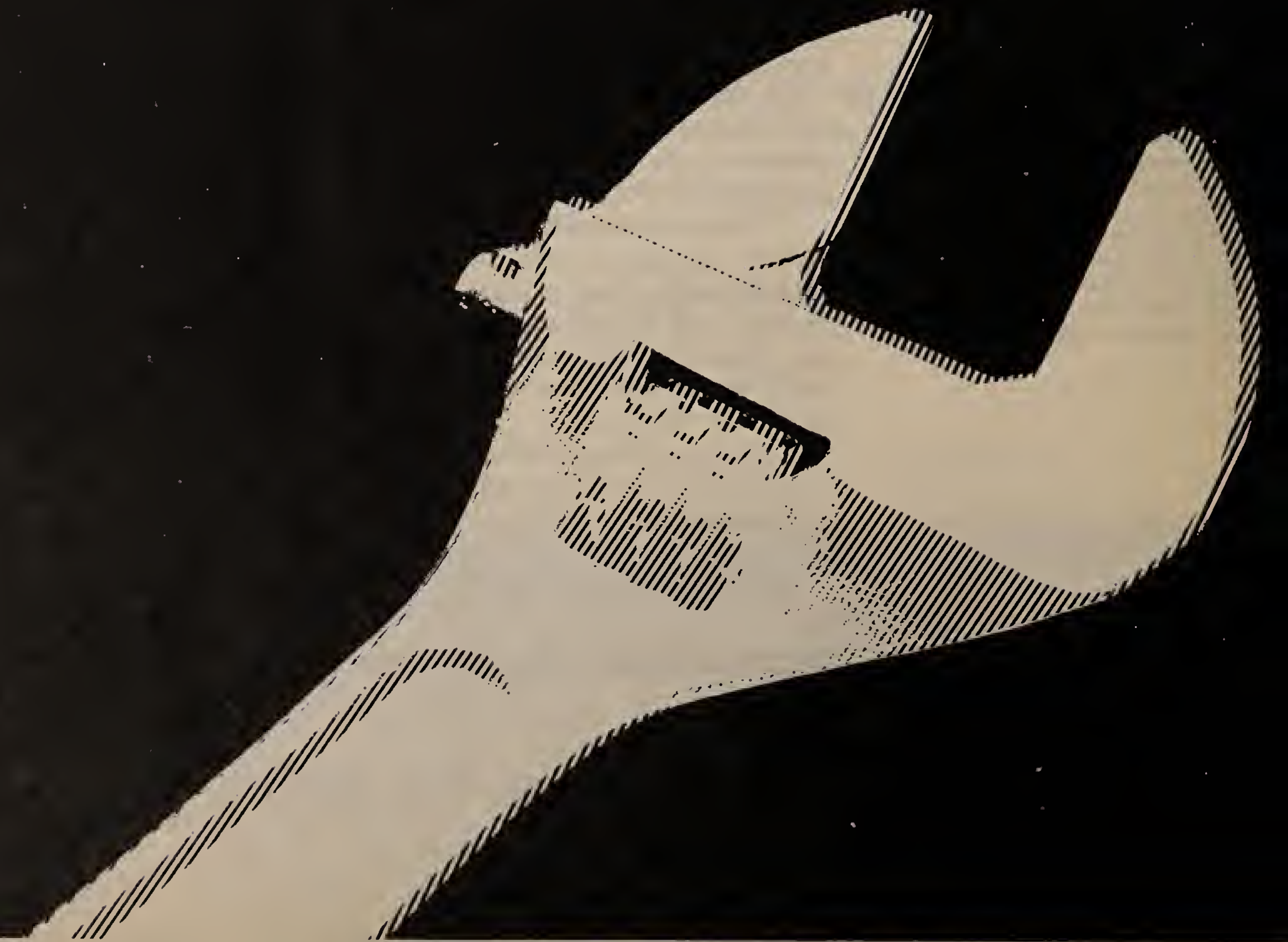

Calling Unit, which provides automatic dialing functions.

The modem is said to monitor signal quality and to maintain uninterrupted transmission by automatically recalibrating the connection. It is fully compatible with other Case 208 modems, including Case modems previously produced under the Case Rixon brand name.

The Soft Channel Card is priced at $890. The USO25 board is priced at $495 for current DCX 850 and DCX 840 users. Both products will be available in the fourth quarter of 1987. The Case 208A/B Modem is priced at $1,195 for stand-alone or rack-mounted versions.

*Case Communications, Inc., 720 Riverwood Drive, Columbia, Md. 21046, or call (301) 290-7710.*

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▶ *ADC Telecommunications*

# Portable T-1 test unit for large nets unveiled

**BY JIM BROWN**
New Products Editor

MINNEAPOLIS — ADC Telecommunications, Inc. recently released a portable T-1 test unit designed to monitor and test T-1 voice lines.

The firm's Series 2000 Portable Test Kit is aimed at users with large private T-1 networks supporting pulse-code modulation (PCM) voice transmission. However, the firm is planning to enhance the unit with a suite of digital data tests in the near future.

The Series 2000 enables technicians to diagnose entire T-1 circuits or any of the individual channels within the T-1 span. When examining the entire T-1 link, the unit analyzes T-1 framing formats and the T-1 transmission protocol. When examining a channel, the unit can be configured to examine the line quality and signaling used in telephone subscriber loop and interexchange carrier applications.

The analyzer enables network managers to ascertain whether T-1 circuits are meeting the specifications spelled out in T-1 tariffs. In addition, the unit monitors T-1 circuits and can be used to certify new T-1 installations.

The unit's LCD screen is capable of displaying eight lines, each of which can be up to 40 characters long. The LCD also displays menu-driven software prompts, enabling the user to select which test to run from a predefined list. The software enables users to enter test parameters directly into the predefined test routines.

Currently, the device will measure such items as bit error rate, framing errors and transmissions received with all binary 1s. It will also calculate the number of times a retransmission due to an error is received with errors.

The unit supports full-duplex communications on channels being tested and includes two receivers and transmitters. It is compatible with D1D, D2, D3/4 and D5 superframe and extended superframe formats, as well as AMI and B8ZS formats. The unit employs digital signal processing technology when testing voice lines. According to ADC Telecommunications, this technology differs from the previous method of converting PCM signals to analog via a coder/decoder in order to measure line noise and signal quality and then converting the analog signal back to digital format for display on the unit's screen.

With digital signal processing, the unit stores line noise and quality parameters in digital format. A proprietary algorithm is then used to compare the PCM signal from the channel against the stored parameters.

With digital signal processing, the unit stores line noise and quality parameters in digital format. A proprietary algorithm is then used to compare the PCM signal from the channel against the stored parameters and then to report the results directly.

This procedure reportedly eliminates the need for calibration and alignment of the audio test portion of the system.

The unit is also capable of pulling suspect data, such as dual-tone multifrequency signaling, from within a channel and inserting a test stream into that channel. The technician then compares the test data at the receiving end to see if it has been altered.

The unit can perform loop-back tests on the T-1 circuit and will act as a channel bank in order to test the T-1 signal as it is terminated.

A Series 2000 Portable Test Kit is priced at $7,995.

ADC Telecommunications is located at 4900 W. 78th St., Minneapolis, Minn. 55435, or call (612) 835-6800.

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STANDARDS

JAMES HERMAN

# Restructuring an industry

Standards will change the competitive structure of the computer and communications industries. The rest of the decade will see rapid progress in ratification and implementation of vendor-independent standards for voice and data communications. Next year, key CCITT standards such as Integrated Services Digital Network will be ratified.

Work is accelerating on International Standards Organization (ISO) network management standards, and Electronic Data Interchange standards are emerging. The 1990s show promise of being the decade in which international standards replace proprietary approaches such as Systems Network Architecture and DECnet.

These standards will increase competition and create new opportunities. As explained in Harvard Business School professor Michael Porter's landmark book, *Competitive Strategy,* five major forces govern the competitiveness of any industry. Analyzing these can reveal the potential impact of standards. Here's a summary of Porter's approach.

The relative power of existing industry participants is the first force to consider. Vendor-independent standards and the concept of open systems weaken the position of entrenched vendors, who have invested heavily in proprietary protocols and architectures. The major vendors' efforts to have their existing products accepted as standards are strategic reactions to this problem.

Examples of this include IBM's attempt to get LU 6.2 adopted as an ISO standard and Digital Equipment Corp.'s efforts to convince the Manufacturing Automation Protocol community that Ethernet should be part of a manufacturing solution.

The most profound effect of standards will be on a second competitive force — buyers' bargaining power. Standards will alter the balance of power between users and vendors, giving users more choices and making it easier to mix equipment from different vendors. User-driven standards efforts such as MAP and Technical and Office Protocol give evidence to this prediction.

Competitors in the existing communications and computer industries are also buyers of other firms' products. Their relationship with these suppliers represents the third force at work.

The ratification of communications protocol standards may create the possibility of implementing them at the chip level. What are major front-end devices today may be merely a chip or two on a simple I/O card in the future. In this way, chip suppliers grab part of today's market for themselves through forward integration. This might explain why Intel Corp. was a major supporter of the Corporation for Open Systems.

The threat of new market entrants is the fourth force at work. International standards could facilitate the introduction of foreign products into the U.S. market, although this might be offset by the corresponding opening of foreign markets to U.S. suppliers.

Standards will lower market entry barriers since they decouple communications software from application software. The OSI approach unbundles communications software and allows many firms to supply the pieces. For example, standards for network management will open a new market for network management systems, in contrast to the current situation in which users must purchase management systems from their communications switch or controller vendor.

The last force is the threat of substitutes. The new standards, in effect, create a new set of products that will eventually replace today's proprietary systems.

Many options are open to today's players in the communications and computer industries. Although standards allow users to create multivendor networks, clear advantages to buying an integrated product line from a single supplier such as IBM, DEC or AT&T will remain.

Other firms, such as Retix, Touch Communications, Inc. and Omnicom, Inc., are trying to establish an identity as specialists in the new protocols and services by getting a head start on the competition.

Competition on the basis of quality should intensify when functionality is determined by standards. Quality might mean reliability or ease of use. Concentration on customer service and support will certainly pay off, as it has for IBM.

But the increased competition that comes from standardization will result in a hard-nosed price and performance race. This should be good for users, but may not be so good for today's industry players. ◘

*Herman writes, teaches and consults on telecommunications technology in Cambridge, Mass.*

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MODIFIED FINAL JUDGMENT

ALAN PEARCE

# A second-rate decision

The regional Bell holding companies have little or nothing to celebrate following U.S. District Court Judge Harold Greene's recent opinion and order on the line of business restrictions contained in the Modified Final Judgment.

Greene made the following decisions about the RBHCs' future business activities:

- The RBHCs cannot enter the long-haul services field in competition with AT&T, MCI Communications Corp., US Sprint Communications Co. and the other common carriers because the RBHCs still have control over the so-called local exchange bottleneck facilities.

The RBHCs can't even offer cellular and mobile services between local access and transport areas, despite the fact that the removal of this restriction was supported by AT&T.

- The RBHCs will not be allowed to enter the telecommunications equipment manufacturing industry. Greene has complicated this matter by already allowing the RBHCs to develop software and to market, install and maintain customer premises equipment, all of which are regarded as integral parts of the equipment manufacturing process.
- The RBHCs cannot offer information services content. The precise meaning of this restriction is unclear and may be sorted out in the paper hearing that's already under way. Nonetheless, Greene wants to prevent the RBHCs from owning the data bases necessary to providing information services.
- The RBHCs may provide transmission facilities for information services. The ingredients of such facilities will be decided by Greene following the public hearing process.
- The RBHCs will not be permitted to offer electronic Yellow Pages because of the dangers posed to newspapers that depend on classified advertising for their revenues. Greene says there could be grave First Amendment implications if telephone companies were allowed to present the equivalent of electronic classified advertising. They could, perhaps, drive newspapers out of business.
- The RBHCs will be encouraged to offer an electronic, on-line version of the white pages.
- The RBHCs will not be required to ask Greene for waivers to enter nontelecommunications activities. The original restrictions placed on their nontelecommunications business activities — namely the establishment of separate subsidiaries, 10% revenue limitations, restrictions on debt financing and Justice Department monitoring — have been abolished.

Unfortunately for the future of the telecommunications and information industries, Greene's order raises as many problems as it resolves. Some of these could create complications for telecommunications network users, even though these users have endorsed — perhaps mistakenly — Greene's order. Among the major problems are the following:

- Now that the RBHCs are to be kept out of the information services market, where is the financial incentive for them to develop open network architecture (ONA) under the Federal Communications Commission's Third Computer In-

*Pearce is president of Information Age Economics, a telecommunications research firm in Washington, D.C.*

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Contact Steve Moore, features editor, *Network World,* Box 9171, 375 Cochituate Road, Framingham, Mass. 01701, or call (617) 879-0700, ext. 732.

## ▶TELETOONS — By Phil Frank

The Communications Manager's Handbook: Rule #25
Be sure you were actually hired by your company rather than leased.
Phil Frank

quiry policy? It will cost each RBHC an estimated $5 billion to $7 billion over the next few years to upgrade its facilities sufficiently to implement ONA. The FCC had said that if the RBHCs introduced ONA, they could offer enhanced telecommunications services — regarded essentially the same as information services — via the public switched network.

- Drawing a clear line between the provision of information (which the RBHCs cannot do) and the transmission of information (which they are encouraged to do) may be impossible.
- The creation of a workable definition of equipment manufacturing may also be impossible. In addition to developing a definition, Greene must rule on what the RBHCs should be allowed to do in research and development, which is closely related to both manufacturing and the evolution to an intelligent network and Integrated Services Digital Network.
- Greene appears to reject the notion of revenue sharing between the RBHCs and information providers. Revenue sharing, however, already exists, in the form of 976 and 900 calls.
- Greene seems to be captivated by the French Minitel experiment, in which the French Post, Telegaph and Telephone administration supplies the transmission medium and a wide array of information service providers permit access to their data bases by subscribers. This is the model Greene wants to impose on the U.S., but this country has a totally different telecommunications and information industry structure than the countrywide transmission monopoly in France.

What comes next? All of the RBHCs will appeal Greene's order to the Circuit Court of Appeals for the District of Columbia and, if things continue to go badly for them, to the Supreme Court. Congress, which stood on the sidelines for the past 12 months, may also enter the debate again.

Clearly, the issues raised by Greene are vitally important. They have a direct bearing on the creation of an intelligent network as we careen toward the information age. If the wrong policies develop, the U.S. could become a second-rate power in terms of its telecommunications and information infrastructure. ◻

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**NETWORK PLANNING**

**THOMAS W. FERMAZIN**

# Only problems are perpetual

For more than eight centuries, the human race has been obsessed with the idea of the perpetual motion machine — a device that, once set in motion, would run indefinitely. Such a machine defies the laws of physics, yet some communications managers seem to believe that the perpetual motion concept applies to their private-line networks.

Private networks are great — as long as they work all the time. Unfortunately, even with careful planning, meticulous designing, rigorous vendor selection and the best network management software and equipment, no private network will run indefinitely. Circuits will go down, equipment will fail, and users will get upset. Communications managers must accept the fact that downtime and service interruptions are facts of life.

An example is Amoco Corp.'s recent upgrading of its private-line network. Although alternate routing between company locations was in place, a flooded river on the border between Texas and Oklahoma made managers painfully aware that two presumably diverse circuit paths occupied the same cable crossing the river. Communications to one of the principal data centers was cut off for more than six hours when the cable was carried downstream.

The original network plan had included a second alternate circuit that could have connected the marooned data center, but facility problems delayed installation until a few weeks after the flood.

Like the perpetual motion machine, private networks will eventually fail. But that doesn't mean that communications managers should throw up their hands and say, "Why bother?" They should be taking steps to keep private lines running longer.

Managers should plan realistically. Too often, they don't take the real world into account. They should allow ample time to complete each phase of the installation and to build in some flexibility in anticipation of unexpected delays. Managers who subscribe to the theory of "crossing that bridge when we come to it" will likely be swimming the river instead.

Another management pitfall lies in not expecting the worst. Users should be skeptical of vendor commitments and demand that performance claims be backed with proof. When the vendor contact is from sales, managers should solicit a second opinion from the vendor's engineering or service staff regarding critical product or service capabilities.

Managers should also talk to other users, preferably user companies of a comparable size with a similar business and application. However, they should be wary of "pet" customers who never seem to run out of superlatives to describe a vendor's products. If it sounds too good to be true, it probably is.

Problems may also result when managers don't take all possible types of failures into consideration. Managers should create what-if scenarios and list all the catastrophes they can dream up. Vendors should be confronted with these hypothetical situations. If the representative says something could never happen, don't be complacent. Ask why not.

Managers also get into trouble when written performance commitments aren't received from vendors. Maximum limits on transmission errors, refunds for downtime, guaranteed dates for installation and availability of replacement components are just a few of the issues that should be negotiated in writing.

Redundancy should be a way of life. Managers should plan for all disasters, large and small, as they're bound to occur sooner or later. Every company location should have redundant facilities. Primary data centers should have duplicate redundant circuits, and every location should be stocked with spare multiplexer cards, channel bank cards or data service units.

Finally, when planning the net, managers should get out of the office to avoid distractions. The decisions made during planning will affect the company for years. Like the perpetual motion machine, the perpetually running private network will never exist. But with the right planning, communications managers can come close. ◻

*Fermazin is a senior telecommunications analyst at Amoco Corp. in Chicago.*

# Special Section: T-1 network management

*Without careful planning, implementing a T-1 network can be a manager's downfall.*

ILLUSTRATION ©1987 KEVIN POPE

NETWORK WORLD

Features
October 19, 1987

# A precarious position

**BY MARK LAROW**
Special to Network World

When first introduced, T-1 technology seemed an unimportant development to communications managers. But T-1 circuit costs decreased steadily, and using T-1 to integrate voice and data has become today's hot topic at corporate management meetings and budget reviews. Upper management is on to the T-1 scent and often expects communications managers to save the company anywhere from 10% to 50% on telecommunications expenses through T-1 networking.

Under management pressure, many communications managers don't feel as confident as they once did. Faced with managing these new networks, they must answer questions such as: Which among the raft of new T-1 vendors are reliable? How much can the company save by installing T-1 nets? What's the best way to ensure that a new T-1 network design will perform as well as the company's current networks? What organizational changes must be made to accommodate this new corporate resource?

> Upper management often expects to save on expenses through T-1 networking.

### Design and cost management

Managers responsible for implementing T-1 networks must pay close attention to the network design and subsequent cost-justification process. The cost of two different T-1 networks that satisfy the same basic transmission requirements can vary by 100% or more, depending on the user's design decisions. These decisions are usually based on business requirements, rather than on purely technical considerations, and thus require the manager's participation.

Many managers underestimate the number of interrelated decisions that must be made when designing a T-1 network, decisions that will, ultimately, determine the cost of the network. A manager who instructs his staff simply to develop a least-cost T-1 network design may unknowingly cut short his own career.

In calculating the cost of implementing a T-1 network, managers should include the costs of network downtime as well as those associated with T-1 circuits, equipment and staff. Although assessing the costs of these variables may seem straightforward, the cost of any one affects all others. For example, circuit costs and network management staff costs often can be decreased if the level of sophistication of the multiplexers is increased. However, increasing the sophistication of the T-1 processor generally expands the impact of T-1 system failure, since the system is carrying more traffic over fewer T-1 facilities.

Before an appropriate T-1 design can be completed by the design staff, the manager needs to determine, for each communications application, the costs that would be incurred due to a disruption of service. The manager should define various levels of disruption that might occur and then assign each level a

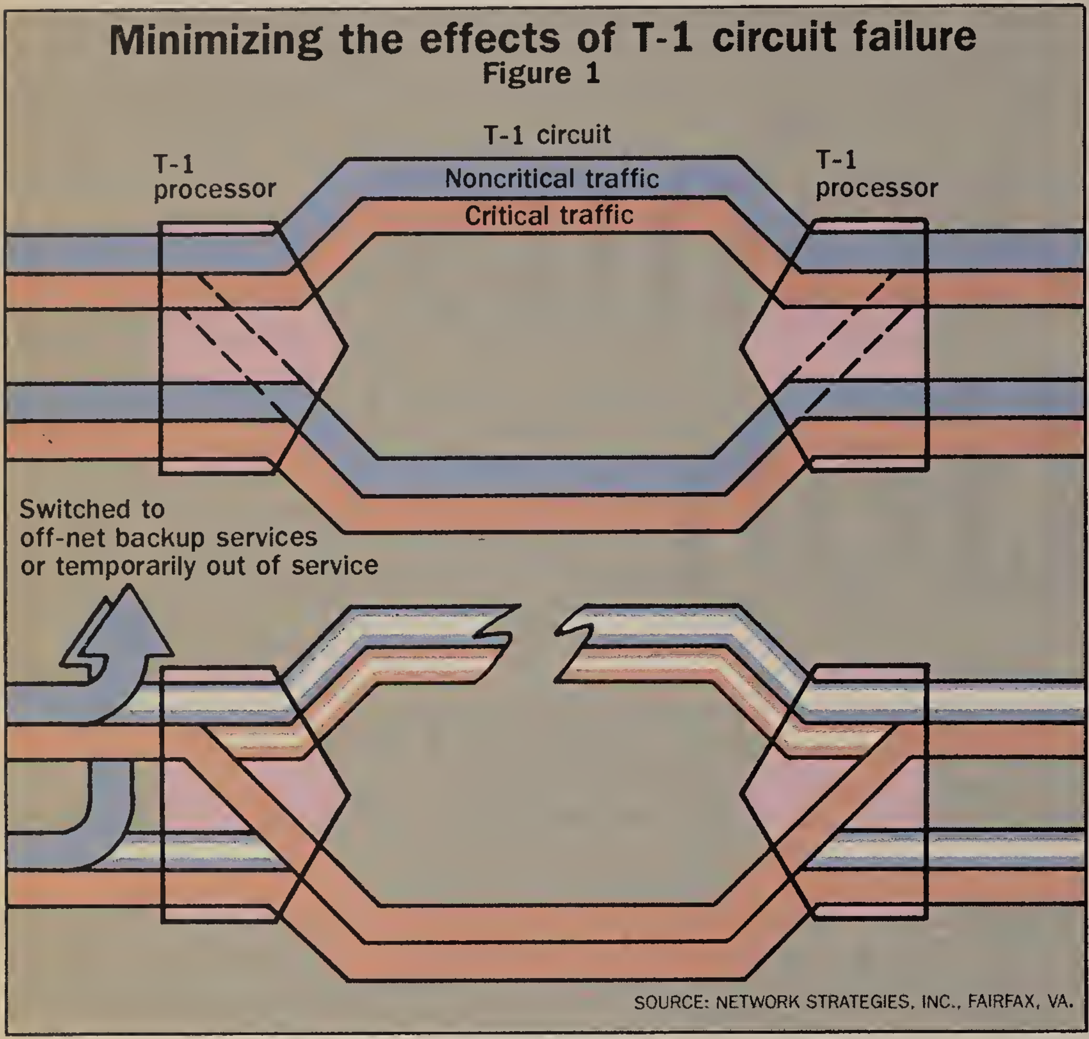
Continued on next page

*LaRow is a group manager at Network Strategies, Inc., a communications consulting firm in Fairfax, Va.*

From previous page

cost per segment of time for the duration of the disruption. This serves to guide the designers in determining the amount of redundancy and automatic restoral that must be designed into the network.

If the estimated cost of downtime is too high, the network will be over-designed to the point where a T-1 network isn't cost-justifiable; if the cost calculated for downtime is too low, the manager might as well begin updating his resume.



**Minimizing the effects of T-1 circuit failure**
**Figure 1**

SOURCE: NETWORK STRATEGIES, INC., FAIRFAX, VA.

### Circuit vs. equipment costs

Another basic business decision managers must make is the quality of voice transmission that should be provided to users. Most corporate T-1 networks are dominated by voice requirements. The bandwidth allocated to voice transmission typically exceeds 75% of the entire network bandwidth.

T-1 systems digitize 24-voice signals into high-speed bit streams, which are then multiplexed onto a T-1 circuit. The higher the bit rate, the better the voice quality. Today, T-1 networks offer voice digitization at standard rates of 64K bit/sec and 32K bit/sec, which are judged to be of toll quality — a level of quality comparable to that of the common carrier networks.

However, advanced voice digitizing techniques such as Digital Speech Interpolation and packetized voice can produce acceptable voice quality at effective digitizing rates of 24K bit/sec, 16K bit/sec and even 8K bit/sec. In a T-1 network design dominated by voice channel requirements, performing low bit-rate voice digitization can greatly reduce the number of T-1 circuits required, thus reducing the total system cost.

Communications managers should have network designs prepared for each level of voice digitization offered by T-1 multiplexer vendors. The resulting cost differences will indicate the advantage of lowering the voice quality in favor of cost savings.

If voice digitization lower than 32K bit/sec can provide significant cost savings, the manager should conduct demonstrations of the various voice qualities (the user's T-1 multiplexer vendor will be happy to assist) for influential groups of users in the organization. A unilateral decision by the communications manager can result in poor network acceptance.

Users can be asked to determine how much more they are willing to pay for different levels of voice quality.

### The costs of downtime

Because a T-1 network places so many communications channels over one physical circuit, circuit failures can cause considerably greater impact on business operations than similar failures in analog circuits.

Several design techniques exist with which to minimize the impact of a T-1 circuit failure. One of the most commonly used techniques is that of spreading critical traffic over as many T-1 circuits as possible. This strategy allows the least disruption to critical applications when a T-1 circuit fails.

Sophisticated T-1 processors have the ability to perform automatic channel rerouting on a priority basis during T-1 circuit failures. This opens the door to many more design techniques that minimize circuit failure impacts. One technique is to provide multiple parallel routes between critical T-1 nodes and to group traffic into three routing categories:

1. Critical traffic that requires on-network backup;
2. Traffic that can be switched to an alternate network;
3. Preemptible traffic (traffic that can be disrupted).

Categories 2 and 3 represent an aggregate category called noncritical traffic, since such traffic can be disconnected from the T-1 network without significant business impact. Most networks contain a significant amount of noncritical traffic. By carefully balancing the mix of each of these categories on all T-1 circuits, the telecommunications manager can ensure that there will always be adequate bandwidth on the surviving T-1 circuits to accommodate all critical traffic from failed T-1 circuits.

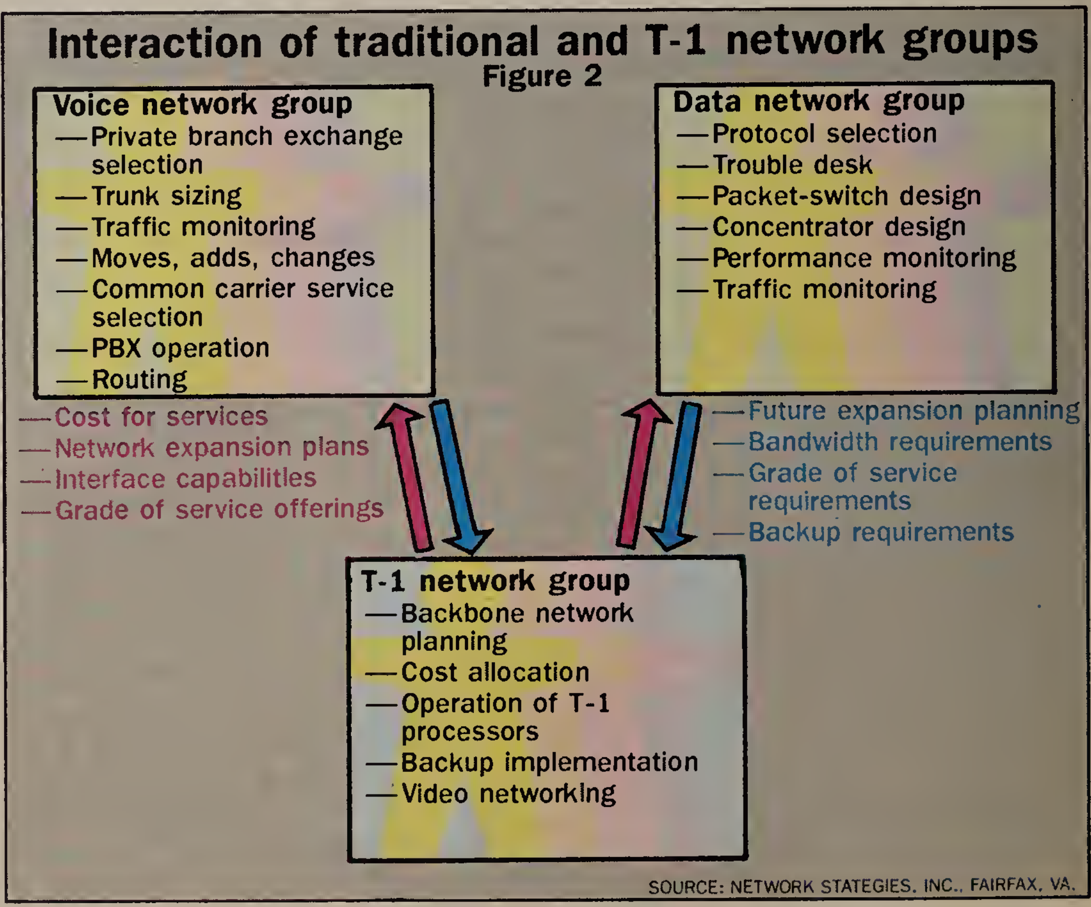
Figure 1 describes a simple application of this principle. A T-1 circuit failure is experienced and all critical traffic is rerouted over the remaining T-1. All preemptible traffic is temporarily disconnected from service while all alternate backup traffic is switched to alternative facilities — usually the public switched network for private branch exchange voice traffic or dial backup for low-speed data circuits.

The design rule being followed is that of only filling each T-1 with as much critical traffic as there exists noncritical traffic on remaining network routes. For a network with two parallel T-1 circuits, the amount of critical traffic for each T-1 should be no greater than 50% and the critical traffic should be spread equally between the two T-1 circuits.

For a network with three parallel paths between two network nodes, a critical-to-noncritical traffic ratio of 66% can be achieved, and the network will still survive a single T-1 failure. The fill ratio for a four-path configuration would be 75%. Naturally, the greater the number of parallel paths between any two nodes, the more each T-1 circuit can be filled with critical traffic. This backup philosophy becomes very complicated to implement, however, when the network isn't a simple point-to-point system.

The communications manager must identify which traffic is noncritical and ensure that design and operational procedures are in place to implement the backup system. This approach will ensure that critical traffic can always reach its destination in the event that any single T-1 circuit fails. Similar design rules can be adopted that will provide the same level of backup even for dual T-1 circuit failures. The analysis, however, requires the use of computerized design tools.

The key to providing cost-effective networking is to fill all T-1s as completely as possible, but this can't be done if users claim that all of their traffic is critical. An effective way around this problem is to charge users a higher rate to provide on-net backup and leave it to users to determine if they want to pay for its benefits.



**Interaction of traditional and T-1 network groups**
**Figure 2**

SOURCE: NETWORK STATEGIES, INC., FAIRFAX, VA.

### Staffing issues

The introduction of a T-1 network often sparks controversy over whether the data or the voice networking group should manage the new network. No answer holds for all cases. However, if the expected T-1 network is a simple design (for example, point-to-point), then the network won't require large amounts of real-time operations or engineering support. In that case, the existing voice or data operations staff can manage the T-1 system effectively.

Each group can make arguments that would support its claim for control of the T-1 network. The data networking group may claim that it understands the intricacies of high-speed digital circuit synchronization and multiplexing. The voice group may claim that it understands voice signaling (the multiplexers are independent of data protocols but not transparent to voice signaling) and that voice requirements dominate the overall bandwidth requirements. But neither of these claims represents an overriding reason to select one group over the other.

More complicated T-1 networks developed to provide both voice and data networking require substantial operations and engineering support. A dedicated staff is generally required to operate and engineer these networks and, thus, they are usually best provided by a third entity: the network operations group.

Continued on page 48

## Special Section: Managing T-1 networks

# Avoiding shell-game shock

### Here's how to see what's beneath vendor claims and make informed T-1 equipment decisions.

From page 1

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explaining the differences among T-1 products. In today's T-1 market environment, with its abundance of misleading marketers, fierce competitors and "brochureware," managers must fully understand how different T-1 products operate.

In addition, because it's difficult to find unbiased consultants who fully understand T-1 technology, users must take on more of the responsibility of performing vendor comparisons.

Key among the myriad factors to consider when comparing T-1 equipment are system architectures, synchronization characteristics, bandwidth management features, data and voice transmission capabilities, network management features, compatibility with standards (see related story on Page 48), hardware management capabilities, processor and power engineering, and product range and support.

Equipment differences related to the above factors can have an impact on a business in several ways. The cost and difficulty of managing the network varies with the degree of hands-on attention the equipment requires from customer and vendor staffs. Management flexibility is affected by differences in the amount and type of information that products provide to support management and engineering of the network.

The overall reliability and availability of the backbone network also is affected by product differences, including everything from throughput to downtime. Although it may not be obvious at first glance, several T-1 multiplexer products require users to purchase additional equipment to perform functions that are standard in competing products. Finally, compatibility with future carrier offerings such as Integrated Services Digital Networks is essential. Although all manufacturers claim to be compatible with all industry standards, in fact, many are not.

The negative operational and financial impacts of changing a T-1 equipment decision after installation make it especially important to reach the correct long-term decision that takes all the aforementioned factors into account.

### Architecture

Major differences exist among T-1 multiplexer architectures with regard to CPU processing, bus characteristics and capacity, configurations and traffic capacity.

■ **CPU processing.** Users should understand what each vendor means by terms such as distributed processing and load sharing, especially as they affect daily operations and system expansion. The CPU processing of T-1 equipment is generally centralized but varies from centralized, load-sharing multiple processors to centralized processors with distributed functions. Systems have anywhere from one on-line CPU per shelf to eight per physical node with optional redundancy, depending on the number and type of cards plugged into the shelf.

Note that manufacturers generally define a shelf as one chassis into which 16 to 20 cards can be placed. A node is a group of shelves, generally from one to eight in total. Physical nodes *may* be able to be interconnected via coaxial cable to form a logical node.

An important vendor difference is whether or not CPU capacity

Continued on next page

*Blackford is a vice-president of data communications at Chase Manhattan Bank in New York.*

From previous page

must be "traffic engineered" by the user operations staff as the network configuration changes through the addition of I/O and trunk (or T-1 aggregate) cards. Some systems require this effort, which entails keeping track of the CPU load per card. Additional CPUs are necessary if the total load exceeds certain thresholds. Other manufacturers don't need to engineer CPU capacity since it's adequate to handle any card configuration.

■ **Bus characteristics.** Vendors' claims regarding aggregate bus speeds, which may range from 28M bit/sec to 256M bit/sec, are often confusing or misleading. Vendors attempt to derive high speeds by adding together the intershelf connections to total an aggregate bus speed. For example, if a shelf bus speed were 28M bit/sec and there were six shelves per node, the aggregate could be presented as 168M bit/sec.

This logic is faulty. Bus speed is a function of clock rate and the number of bits per time slot, not the number of shelves. In addition, shelves may share a common intershelf bus, thereby decreasing access to the supposed 168M bit/sec bus.

Bus speed is important when considering a future T-3 termination. If the bus is only 32M bit/sec, a direct T-3 termination of 45M bit/sec cannot be accommodated. Extra M13 multiplexing equipment is necessary to demultiplex the 45M bit/sec bit stream to individual T-1s, which necessitates additional cards in the T-1 multiplexer equipment. A directly terminated T-3 would not require additional cards.

The number of buses is important in considering potential failure points. Some equipment has anywhere from one to four buses spread over a backplane. Some vendors dedicate their buses to particular functions, such as control or switching. Usually one bus can't take on the load of another if a failure occurs. Other manufacturers implement all functions on one bus. A final approach is to spread functionality over multiple buses with port cards accessing all the buses.

The definition of a bus differs between physical and logical buses. A physical bus is limited by its absolute speed. All port cards may access only one bus, or, if there are parallel buses, each port card may have independent access to all buses. With a logical bus, all cards have physical connections into multiple physical buses, which constitute the logical bus. If a failure occurs on one physical bus, the other three can assume the traffic load.

Failure isolation of buses is important. Isolated gates can be used on control cards so that a short on one bus doesn't affect other buses and failures on bus interface cards can be isolated from the bus.

The physical location of the bus varies. Sometimes it's located on the interior of the chassis with cards plugged into both sides. In other implementations, it's placed toward the rear of the chassis. A greater chance of accidental damage exists in the latter case, since the backplane is exposed once the cabinet door is open.

The logical and physical bus interfaces are important. Some vendors separate the interfaces into two types of cards: bus interface cards and carrier interface cards. The carrier interface card can be either a channel or link card, whether it be RS-232-C, V.35, D4, T-1 or another type. The carrier interface card connects logically to the bus interface card. Then, as standards evolve, only the carrier interface card needs to change.

Another approach is to interface the link and channel cards directly to the bus. As standards change, so do the affected cards (such as RS-232-C, V.35, D4 and T-1). A change may also impact the bus interface if both functions (bus interface and carrier interface) are implemented on

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the same card. More equipment may be impacted in this approach, depending upon the multiplexer's architecture.

■ **Configurations.** System configurations are handled totally in software or in software via tables, dip switches, hardware straps and PROM changes.

A *totally* software-driven system is dynamic and not hampered by manual intervention. Parameters are defined at initial installation and needn't be reset due to network changes. Certain manufacturers, however, make programmable read-only memory (PROM) changes for new software releases. The coordination effort involved in changing PROMs in the field has a negative impact on available resources, network integrity and network availability.

In a system that uses both software and hardware, many tables with lots of parameters must be established, or worse yet, straps and dip switches must be set. To gain an appreciation of the complexity of the tables to be changed, review the vendor's implementation guide and/or user's manual.

As the network grows, so does the complexity of managing such manual update functions. Either in-house staff or the vendor must do updates. In the former case, staff must be available to perform changes and must remember the initial training. If a vendor does the work, a customer must rely on an external resource whose timeliness may not coincide with an implementation plan. Vendors will assist a customer in the initial setup. However, training of staff is crucial.

■ **Traffic capacity.** Traffic capacity or throughput is determined by several factors: bus speed (discussed above), time slot bandwidth, number of time slots and bandwidth utilization.

Time slot bandwidth includes components that individually are insufficient to express throughput. Vendors quote anywhere from 200 bit/sec to 32K bit/sec as the granularity, or time slot bandwidth, and a wide variety of time slot capacities. For example, with a 32K bit/sec granularity and 1,024 time slots, throughput is about 32M bit/sec. With 2.667K bit/sec granularity and 12,000 time slots, throughput also is about 32M bit/sec. As these examples indicate, users should ignore vendor claims based on granularity or time slots alone and evaluate these factors only in relation to each other.

The number of available buses must be considered. If only one bus exists, then the throughput remains 32M bit/sec. If multiple buses are accessed by each card, then the throughput increases by a factor equal to the number of buses.

Nodal throughput is also a factor of bandwidth utilization. With granularity of 32K and data rates significantly below 32K bit/sec, bandwidth is underutilized. For data rates minimally above 32K bit/sec, bandwidth is again underutilized. With a granularity of 2.667K bit/sec, for any data transmission greater than 2,400 bit/sec, more than one time slot will be utilized. In the second case, since the time slot is smaller, the bandwidth utilization is generally better.

Finally, it's necessary to know if bits for internal control communications share the available time slots with bits used only for data streams. If the two types utilize the same groups of time slots, then the quoted number of time slots is not totally available for data/voice transmission.

### Synchronization

Synchronization is essential to the functioning of a digital network. Clock sources can be established either in tables on a node-by-node basis or as a list of system clocks to the entire network. This difference determines how the synchronization function recovers after a clock loss or a T-1 link outage. The gen-

Continued on next page

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From previous page

eral method is for the next prioritized clock to take over if a clock source fails. Managing this with tables on a node-by-node basis will require additional staff time.

If clocks are defined by nodal tables, the backup clocks are defined to the node. The loss of a clock source can cause problems in the network synchronization, since each node acts in isolation from the others. Parts of the network may not be optimally synchronized, and improper synchronization rings may result, which could necessitate manual intervention to correct. Deadlocks occur when two nodes try to synchronize off the same T-1 span that connects them. Clocking rings result when a node's clock source gets into a continuous loop after a primary clock source fails.

The initiation of a secondary clock source causes other nodes to readjust their clock sources, and their ability to lock into a source is disrupted. In addition, as the network expands, tables may change to accommodate a new node, which involves additional staff time.

In the system clock approach, a list of clock sources is defined to the entire network. If the primary clock fails, the next prioritized source assumes synchronization responsibility. The optimal clock source is always chosen.

Vendors handle synchronization either totally in hardware or through a combination of hardware and software. The hardware approach encompasses straps and is less flexible than the second method. The clocking function can be implemented on a separate card in the chassis. If redundancy is required for the clock board, then two slots are necessary, which decreases the availability of slots for I/O or link cards. In the software/hardware method, some of the phase-locked loop function exists in software. This improves accuracy in acquiring incoming frequencies quickly and holding onto them during their comparison to the frequency of the internal oscillator.

### Bandwidth management

Bandwidth management comprises both bandwidth allocation and routing and rerouting of traffic.

- **Bandwidth allocation.** Bandwidth allocation takes two forms: semipermanent allocation and demand assignment. Semipermanent allocation reserves bandwidth by allocating ports on I/O cards for a circuit. The ports are unavailable for other circuits, and the bandwidth is allocated but not utilized until bit streams are transmitted. Bandwidth contention can be handled by prioritizing circuits during order installation.

Semipermanent allocation is less efficient than demand assignment; however, use of demand assignment can lead to problems in certain applications (see related story on Page 47).

- **Routing and rerouting.** Circuits are assigned to routes via nodal tables, nodal software with periodic refresh or dynamic allocation.

> Vendors handle synchronization either totally in hardware or through a combination of hardware and software. The hardware approach is less flexible.

With a table-driven system, the following must be specified: origination node, destination node and physical card location. Routing tables of paths between nodes must also be administered. A maximum number of configurations per node are allowed. Nodes search for an available path until one is found, but the chosen path may result in a suboptimal route.

If a T-1 fails, a reroute occurs by the checking of available routes in the tables. Since tables must be reevaluated as network changes occur, this method is the most labor-intensive of the three.

Routing via nodal software with periodic refresh maintains tables that are refreshed periodically (usually about every 10 sec) with information regarding T-1 conditions. A trade-off exists in that frequent updates utilize bandwidth for control information and use up CPU resources, while infrequent updates result in tables holding outdated information. Delayed rerouting can occur if a node is unaware of a T-1 outage, and the system attempts to reroute to the failed T-1, and then must again attempt to reroute using a different T-1.

In a dynamic routing process, only the endpoints are specified and the system software deter-

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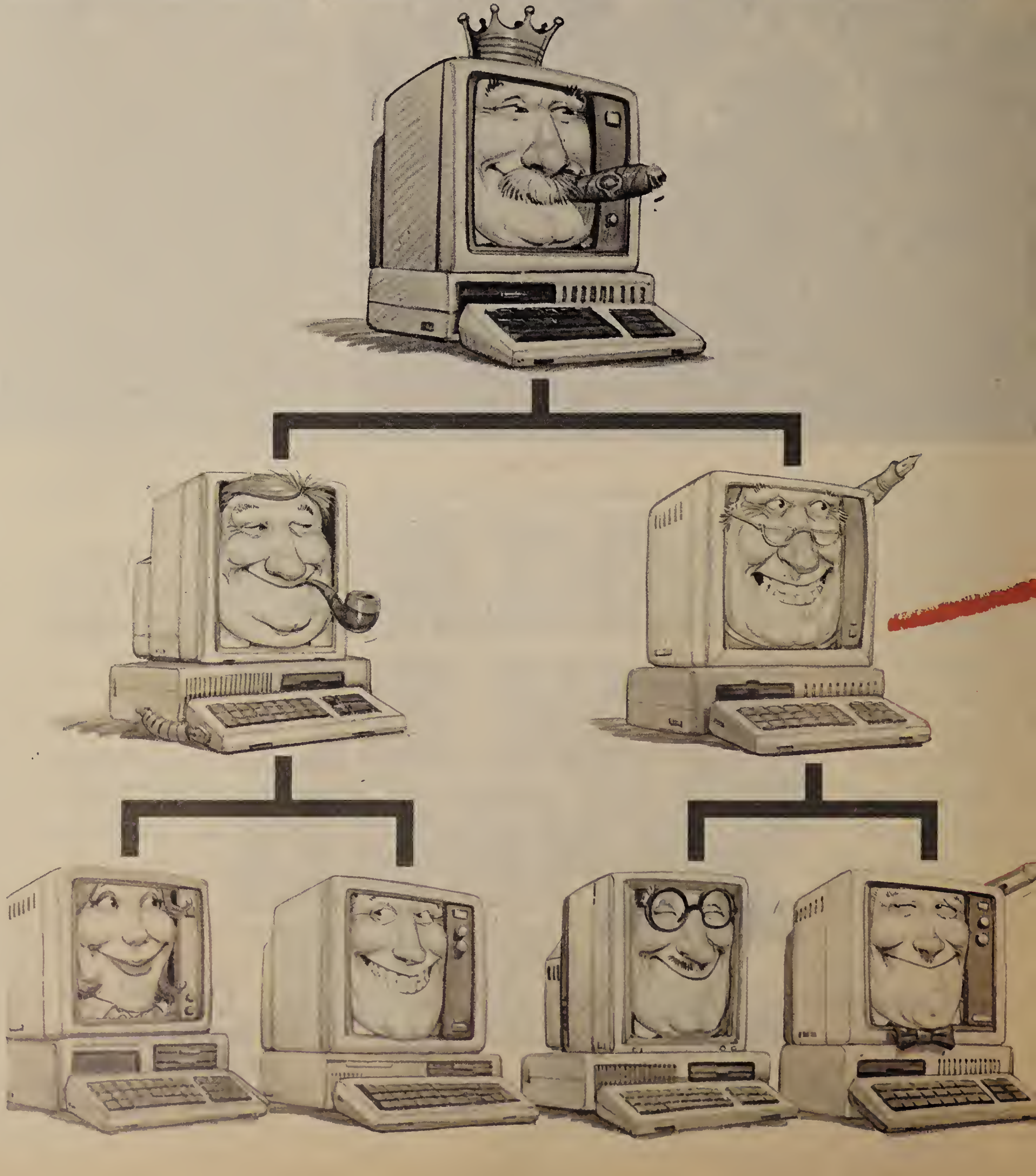

mines the optimal routing. No tables are necessary. Availability of transmission paths is known before a call is set up, and a call is allocated bandwidth only when it can be completed. The optimal route is always chosen since the system has global knowledge of connectivity and bandwidth.

All T-1 multiplexers perform a time-of-day routing function in which circuit connection can be specified for a particular time; however, implementations differ.

All T-1 multiplexers perform a time-of-day routing function in which circuit connection can be specified for a particular time; however, implementations differ. One method is to preempt existing traffic to gather enough bandwidth for the circuit. Another is to gradually acquire the necessary bandwidth prior to the designated time by routing new traffic along other paths. The difference lies in the amount of disruption for the user.

Bypass, or tandem, routing is the process of switching traffic through a node. Bits are demultiplexed but aren't sent to I/O cards. Some vendors accomplish this function via a separate card in the shelf. A maximum number of bypass channels per node is available. Tables define the source and destination of traffic as well as the maximum number of intermediate nodes.

If the bypass routing capability overloads after the failure of a T-1 circuit, then prioritization of circuits automatically occurs, and the lower priority circuits won't reroute because bandwidth isn't available.

In more modern multiplexers, there's no bypass function. This design is superior because traffic is handled as part of the normal switching function on and off the data buses.

**Data transmission**

Several different methods are used for accommodating asynchronous and synchronous traffic.

- **Asynchronous traffic.** Three methods exist for handling asynchronous traffic: using a single card for asynchronous and synchronous data, using a statistical multiplexer as a front-end to the T-1 equipment and oversampling. The single-card method is flexible and requires no management of external equipment.

The front-end option increases equipment costs and introduces another failure point that may not be covered by the network control system. Proponents of this method argue that the per-port cost of the first solution is too high. However, users should perform a cost/benefit analysis of these two solutions. In addition, if it's desirable to use flow control and data compression to save bandwidth, then the statistical multiplexer solution may be preferable to the card solution.

The last method, oversampling, is a technique whereby the bits are sampled and transmitted at a higher rate than the I/O speed, typically four or more times. The overhead is high, and additional bandwidth of at least four times the original data rate is utilized.

The fact remains that many asynchronous devices are currently in existence. The requirement for them is still valid, and users should remain as flexible as possible in handling this type of traffic.

- **Synchronous traffic.** Transmitting computer-aided design and manufacturing data and other high-bandwidth applications over long distances can present problems if delay through a node is excessive. This delay affects both interactive and batch transfers. Due to the characteristics of a synchronous protocol and its error-correction procedures, a long delay can cause information transfer to slow down dramatically or buffers to overflow, requiring the user to implement otherwise unnecessary link-recovery procedures.

Vendors attempt to skirt the nodal delay issue by discussing broadcast, that is, batch, applications. These applications, however, would use a synchronous protocol and be subject to the same problems discussed above since synchronous protocols require two-way data transmissions.

**Voice transmission**

A major difference between vendors is the delay through a node introduced by the T-1 multiplexer equipment. Excessive delay can require the use of echo cancelers, depending on the network size. Once

Continued on page 47

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# The dangers of demand assignment

The dangers of feature comparisons between T-1 multiplexers are brought to the fore by a capability sometimes termed "demand assignment." Demand assignment for voice circuits allocates bandwidth only when needed for a specific trunk in response to an off-hook signal. This highly touted feature can lead to problems, whether or not bandwidth is available.

Consider private branch exchange-to-private branch exchange trunk groups. If bandwidth is available, the T-1 multiplexer must detect an off-hook signal from the originating PBX, PBX A, and set up the physical circuit.

The T-1 multiplexer delay introduced by off-hook detect time from PBX A, circuit set-up time and the delay in passing the "wink" (that is, PBX-to-PBX signaling) response from the terminating PBX, PBX B, can interfere with the PBX manufacturer's preset interval for a trunk response time-out.

This time-out is based on off-hook detect time by PBX B, delay in passing the wink to PBX A, as well as the receiver attachment time. During the busy hour, the receiver attachment time will increase since receivers are statistically shared among all trunks.

The time-out is typically set in the range of one to three seconds, and the T-1 multiplexer may cause a delay of 800 msec or more. Under busy-hour conditions, this multiplexer delay cuts into the time-out range and can interfere with the PBX manufacturer's engineered grade of service.

Thus, when bandwidth isn't available, the multiplexer has no easy way of communicating this condition to the PBX. Once bandwidth is full, the last call causes the T-1 multiplexer to send simultaneous off-hook conditions to the PBX for all the remaining idle trunks, which blocks further calls from the trunk group. Trunk seizures en masse are not what a PBX is designed to see, and the resulting load on its CPU causes major problems.

This situation is further exacerbated when a call in progress is disconnected. Since bandwidth becomes available, the T-1 multiplexer sends simultaneous on-hooks to the PBX. This en masse release of the blocked trunks also overloads the CPU of the PBX. This continual thrashing, which will occur more often during the busy hour, is not acceptable.

With private ring-down lines, problems also result if bandwidth isn't available. There are no PBXs in the connection, only telephones or turrets, and thus no thrashing occurs as in the above discussion.

However, these lines are used for critical, high-usage, time-sensitive communications, typically in brokerage and trading situations. Busy signals are intolerable, so the network must be engineered for peak-load traffic. Thus, little or no value is derived in contending for bandwidth. Considering this requirement, using demand assignment for private-line ring-down circuits makes little sense.

*— Victoria Blackford*

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a round-trip delay of 40 msec or more is encountered, echo cancelers are necessary.

With a nodal delay of 5 msec, once three nodes are traversed, echo cancelers are necessary to account for other delay contributions, including those incurred in the transmission media (5 msec X 3 nodes X 2 directions + transmission media). Vendors may attempt to cloud the issue by talking of the delay inherent in tail circuits, other equipment and off-net dialing, but the real issue is T-1 equipment delay.

### Network management

T-1 network management systems differ in the hardware available, network reports available and generated, and interfaces to other network management systems such as IBM's NetView/PC.

■ **Hardware available.** The usual hardware configuration includes an IBM Personal Computer AT, which has inherent limitations and inflexibility, especially with large networks. A more desirable system would be a multitasking, multiuser microprocessor with large disk capacity, which can provide more capabilities, including high-resolution graphics, mouse-based user interface and multiple windows.

Vendors may display various systems at trade shows while hedging their responses to implementation questions. Inquire as to beta and production times and locations, and don't forget that comparisons of vendors should be based primarily on existing capabilities.

■ **Reports.** Reporting capabilities may be ad hoc, or standard and predetermined. Ad-hoc reporting allows user queries against a variety of information stored in powerful relational data bases that provide extensive reporting capabilities. Menus enable users to choose categories according to specific needs. With predetermined reports, there's little flexibility; programmers can write code for more reports but only at an additional expense to the user. Network information provided in reports should be easily accessible and allow managers to be proactive.

■ **NetView/PC.** NetView/PC is IBM's interface between non-Systems Network Architecture devices and NetView. The final interface code has been released, and some T-1 multiplexer vendors now have products that support NetView. Because NetView/PC has several inherent problems, T-1 users should not employ it as their only network management system. NetView/PC's capabilities are limited by its use of the Personal Computer AT, fixed partitioning within PC/DOS, and the code space (in kilobytes) within PC/DOS available to vendors for alarm reporting. Clearly, all alerts from a T-1 network aren't passed to NetView. Also, once the disk fills with alarms, an operator must manually clear them out before any more can be accepted.

### Hardware management

Hardware management encompasses inventory control; connections between shelves; addition of cards, shelves and nodes; and power supplies.

There are three methods of managing the card inventory in an equipment configuration. With the easiest method, each card has a PROM that carries card type, serial number and the release number. This information is automatically uploaded to the network management system, which then displays the appropriate information if a card has been changed. In the second approach, the system provides similar information only if queried. A third method is purely manual in that staff must maintain written records.

■ **Connections between shelves.** Connections between shelves can include anything from ribbon cable to shielded coaxial cable. Unshielded ribbon cable may present electromagnetic interference problems and necessitate the installation of an additional cabinet for shielding.

Adding or changing a card may present several potential problems. Powering down a shelf to accomplish the add or change disrupts the network and shouldn't be necessary. Adding cards can drain power supplies and may require additional or backup power supplies. One may also find that the power requirements of a T-1 link card may not allow for the installation of the maximum number of cards (see Processor/power engineering below for additional information).

At one extreme, adding a shelf is as simple as sliding it in, connecting intershelf cables, installing power supplies and plugging in the T-1(s) — all without powering down the node. Any circuit orders previously entered into the network management system will come up at the predetermined time

Continued on next page

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From previous page

and day. All software is loaded from an adjacent shelf. At the other extreme, the manufacturers may require the node to be powered down to add a shelf, in which case the software may have to be reloaded, disrupting the network.

Adding a node can be done in several ways. One method is to install the equipment, input circuit orders to the network management system, decide if the definition of system clocks is adequate and hook up the T-1s. Another scenario entails installing the equipment; building the synchronization, routing, rerouting and bypass tables; reevaluating all other tables; and hooking up the T-1s. The latter is far more labor-intensive than the former and will require vendor assistance if customer technicians aren't properly trained.

- **Power supplies.** Determine if power supplies are load sharing or hot standby. Load sharing is more reliable, as all power supplies are in operation on a daily basis. One need not wonder if the hot-standby power supply will work when the primary fails.

### Processor/power engineering

The configuration of a node is important especially as it relates to the card placement, power requirements per shelf and maximum number of T-1s per shelf. Installation/configuration manuals provide valuable information for understanding the effort involved in setting up a shelf and adapting as cards are added. Some systems require much more effort than others. Depending on the CPU load factors and power requirements for a shelf, certain products may have the following characteristics:

- Cards are not interchangeable among slots.
- Power requirements of cards may limit the number of T-1s per node.
- Not all card slots can be utilized due to power requirements.
- Additional CPUs are necessary.

Restrictions such as these are nuisances that a network manager should not have to put up with.

### Product range and support

Within the past year, several T-1 manufacturers have been acquired by or have entered into joint ventures with other companies. Companies that offer more than a T-1 multiplexer allow customers to extend their network control capabilities beyond the high-speed T-1 facilities.

Vendors often tout minimally enhanced features that appear on the surface to be new and different. When a vendor introduces a new or upgraded product, users should make sure that the limitations of the older product haven't been carried forward to the new one. If the basic product architecture is the same, then the capabilities won't vary significantly.

- **Support.** Support encompasses everything from warranty to a technical assistance center that can dial into a customer network to perform diagnostics and routine monitoring. Hot standby of essential cards such as the CPU is important. One should recognize that servicing equipment that is software-driven doesn't require an army of field engineers. Furthermore, if customers are allowed to change cards themselves, the one-half hour response time decreases in importance.

### Summary

Potential buyers of T-1 network processing equipment often base their decisions on superficial feature comparisons without an in-depth understanding of the basic building blocks of the competing products. But it's essential to comprehend the "how" of equipment, not just the "what."

Flexibility and ease of management are crucial to a T-1 network's success. Buyers should choose equipment that will operate well under difficult conditions but that also minimizes the need for human intervention.

Vendors can be misleading in product discussions and in answering direct questions relating to existing vs. future capabilities. To support their companies properly, communications professionals must fully understand the products, know what to ask and filter vendors' answers thoroughly.

## Desperately seeking true compatibility

Virtually all T-1 multiplexer manufacturers claim to be compatible with all T-1 standards. But users must determine whether the compatibility extends throughout the equipment or exists solely at the interface to the T-1 facility. It's also necessary to determine whether each vendor's implementation complies with the entire relevant AT&T Technical Reference publication, in this case number 62411.

For example, proprietary framing techniques may compromise ones (pulse) density compatibility to accommodate extra DS0 channels. Proper ones density requires 192K bit/sec to comply with AT&T's Technical Reference.It states that for an unchannelized circuit, two conditions must be met. First, no more than 15 consecutive zeros can be transmitted. Second, within every time window of 8 x (n+1) bits, and for all values of n between 1 and 23, at least "n" 1s must be present.

| 1 | 2 | 3 |
|---|---|---|
| 10000000 | 00000000 | 00000001 |

Elaborating on the second condition above, if 192 bits are transmitted, a minimum of 23 ones must be present. It's important to note that although 15 consecutive 0s can occur, this may happen only once in a 192-bit frame. Consider the example shown of three consecutive DS0 channels.

Since data in each DS0 is independent of data in all other DS0 channels, the first DS0 could have a one in the most significant position. If the next DS0 has all zeros, it would seem to meet the requirements for at least one one in the 16-bit window. However, if the third DS0 contains a one in the least significant position, there would be 22 zeros in a row. Thus, each DS0 must contain at least one one to fulfill both of the ones density conditions noted above. The total number of inserted ones in a T-1 frame would be 24. Since each frame is 125 microsec in time (equivalently 8kHz), 192K bit/sec of overhead is necessary to comply with ones density (192K bit/sec = 24 bits x 8kHz).

Finally, proper ones density is a requirement of Part 68 of the Federal Communications Commission Rules concerning connection of equipment to the telephone network. If the multiplexer violates these rules, the channel service unit will overwrite the required number of ones, resulting in errored data.

Strict compatibility with AT&T's Technical Reference is essential, as transmission vendors will bring out many new offerings in the future.

— *Victoria Blackford*

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## A precarious position

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Figure 2 on Page 40 depicts the interactions between the T-1 network operations group and the traditional voice and data communications departments. The important distinction is that the T-1 backbone network organization provides bandwidth services to the voice and data networks just as the telephone companies provide bandwidth services to traditional networks. As such, the organization should be functionally independent of either the voice or the data network engineering and support functions.

The T-1 network group must perform several functions in support of the corporation's voice and data networks. It must provide a published grade of service to the voice and data network designers and it must clearly state the levels of backup available and the costs associated with providing each level of backup.

Furthermore, there must be clearly defined procedures for the voice and data groups to use when ordering additional bandwidth on the T-1 backbone.

Careful planning must be undertaken so that T-1 bandwidth is available when needed by either the voice or data network.

The T-1 network group should also assume responsibility for any videoconferencing, since this function usually depends on the switching capabilities of the T-1 processor system and backbone bandwidth.

Finally, as a provider of T-1 bandwidth, the T-1 network group becomes, essentially, an internal telephone company within the corporation. If that's the case, perhaps the real management trick for this group may be to avoid following in the telephone companies' bureaucratic footsteps.

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## Timeplex, NET record earnings

continued from page 2

company's Link family of high-end networking switches and network management systems "made significant contributions to revenue" for the quarter, while sales of statistical multiplexers declined.

Frank said Timeplex's delivery of the Link/100, a high-end sophisticated switch, "assuaged its customer base, which thought that the Link/2 was a generation behind other switches on the market." Timeplex has a wide customer base, he said, "and all they have to do to succeed is hang on to it."

Safecom Partners, a joint venture formed between Timeplex and Comsat General Corp. last month to sell T-1 satellite services, is expected to have a small positive impact on Timeplex's second-quarter revenue but will negatively affect earnings due to start-up costs, the company said. ◘

## X.400 wins U.S. fans

continued from page 4

IBM, and Hewlett-Packard Co. systems. Lovestedt, who is scientific computing operations manager, is primarily responsible for managing DEC equipment. He said he hopes his purchase of DEC's X.400 product will prompt managers in other departments to push their vendors for X.400 capabilities.

The Forest Service is currently testing both Telenet's X.400 service and DG's product, dubbed DG/X.400, said Steve Werner, telecommunications branch chief. The Forest Service is a large DG user with approximately 850 minicomputers linked via an X.25 network. The organization also uses Telenet's Telemail service to communicate with state agencies, the Department of Agriculture and other federal agencies, Werner said.

Until the recent linking of Telemail and CEO via X.400, Forest Service mail users had two mailboxes, one for each service, Werner said. Now all Forest Service mail users are able to send and receive mail via CEO, regardless of which system the other user is on.

Telenet recently announced that its Telemail 400 service will link to private mail systems using X.400. The first service to be supported is DG's CEO, with a link to DEC's All-In-1 slated for delivery by year end, according to Telenet.

Bridge Communications, another early user of the Telemail/CEO connection, recently began using the system to communicate with DG, one of its customers. "The main benefit is avoiding telephone tag," said Jim Geers, manager of OEM and major accounts at Bridge Communications.

Bridge Communications and DG will initially use the E-mail system to exchange product information and get status information on purchase orders. Over time, Geers said, he anticipates the messaging system will be used to exchange invoices and purchase orders. ◘

## Users satisfied after meet

continued from page 5

work on the different switches.

Both Garrison and Linda Virden, systems software manager in the telecommunications group for San Francisco-based Macy's California, Inc., said Rolm officials made it clear that users would have to press the switch maker to obtain a CBX II, by showing a special need for the switch.

Rolm executives told NRUG officers that, beginning July 1, none of Rolm's independent distributors will have exclusive rights to sell Rolm products in their territories, Garrison said. Currently, according to Garrison, prices of products bought from independent distributors vary widely and are often higher than prices for comparable products purchased through the Rolm Systems Marketing Division.

Ken Batorski, general manager of Rolm's Independent Distributor Division, said Rolm had 10 regional distributors with exclusive rights to sell Rolm products. He confirmed that, beginning in July, users in those territories will be able to purchase Rolm gear from IBM. Batorski said the move was not a result of Rolm's being dissatisfied with the independent distributors. Instead, he said, the change is designed to give users a choice of distributors.

"I was very pleased with the meeting," said Steve Lundsford, voice network manager for First Tennessee Bank N.A. in Memphis, Tenn. "We are the first users group that top IBM and Rolm officials have met with." Lundsford, who purchased a Rolm CBX 90000 AE in July, said he was reassured by Rolm's promise.

Garrison conceded that it was necessary for IBM to introduce the 9750 to recapture Rolm's slipping share of the switch marketplace. Garrison said he was particularly pleased by a promise AbuZayyad made to meet with NRUG periodically throughout the year. "We will have strategic meetings, and he will let us know what is coming down the pike," Garrison said. "We tell him what we would like to see coming down the pike." ◘

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# US Sprint rethinks strategy

continued from page 1

tions such as human resources and corporate relations."

US Sprint created two new marketing groups as part of the reorganization, one that will sell to medium-sized and large businesses and another that will target small businesses and residential customers. A third existing group, the National Accounts Division, added another regional operating center to better target big business.

**National Accounts Division**

The National Accounts Division, which is responsible for US Sprint's Fortune 1,000 corporate customers, has been segmented into the West and East Groups, headed by Vice-Presidents Tony Jatcko and Bow Rodgers, respectively.

The company also created a new regional group, the National Accounts Central Group, based in Chicago and headed by Richard Henderson, formerly president of the Midwest division. Clouser said US Sprint sees new opportunities in this region.

The presidents of the regional National Accounts Divisions will report to Richard Smith, president of the National Accounts Group, who in turn, reports to Robert Snedaker, president of US Sprint.

**The Business Market Groups**

The newly created Business Market Groups division will include personnel from US Sprint's existing seven regional sales and marketing divisions, which mimic the territories of the regional Bell holding companies. Those seven divisions will now focus their efforts on medium-sized to large business accounts, where before they also had responsibility for small business and residential customers.

The vice-presidents and general managers who head these regions will report to regional Business Markets Group presidents, all of whom are former US Sprint divisional presidents.

**FON Marketing Group**

A newly created group, the FON Marketing Group, will be headquartered here and be responsible for sales and service for small business and residential customers.

FON, which is an acronym for fiber-optic network, is named after US Sprint's FONcard calling cards. Steve Akin, formerly vice-president of operations for United Telephone Systems, Inc.'s Midwest Systems Group, will head up the group as senior vice-president, customer sales and operations.

According to Robert Wilkes, a senior analyst with New York-based Brown Brothers Harriman & Co., the US Sprint reorganization "reflects US Sprint's shift to emphasizing the corporate customer who brings in the revenue. That's part of Snedaker's strategy, but it's a little late in coming because he's been dealing with other problems, such as billing."

"US Sprint has done the right thing by dedicating more resources to the corporate customer," said Fritz Ringling, a principal with Booz, Allen & Hamilton, Inc. in Washington, D.C. "Those accounts bring in the bacon and are critical to US Sprint's long-term existence. The reorganization will allow them to compete better with AT&T."

The reorganization follows an earlier one in which the responsibility for US Sprint's network operations and support staff was shifted from the seven divisional presidents to corporate headquarters. Clouser said having the operations staff report to headquarters is the best way to control installation and maintenance operations.

Joe Gallo, chairman of US Sprint User's Steering Committee and communications manager for Automatic Data Processing, Inc., said he approved of US Sprint's moves. "I have never had problems with the sales side, but I have from the operational side," he said. "US Sprint needs to shorten its provisioning process — it was taking too long to get service because the seven-division structure slowed things down. These reorganizations should make things more efficient."

Clouser said under the new organization, Telenet President Guidi will be working closely with Smith, president of the National Accounts Group to determine how to jointly pursue voice and data accounts.

# AT&T plans to merge S75/85

continued from page 1

tem to the larger system, or from release to release, and retain 80% to 90% of their current investment in hardware." The announcement comes on the heels of IBM's release of the 9750 Business Communications System, an IBM PBX line built by Rolm Corp. that supports from 100 to 20,000 lines and supersedes the older Rolm switches.

AT&T's technical goal with its statement of direction, Griffiths said, is to combine the advantages of the System 75 (low price, high-density port boards and popular system management interface) with the advantages of the System 85 (robust feature set, powerful processor and strong networking capabilities).

He said AT&T will bring those attributes together in one family of processors capable of supporting 100 to 30,000 lines and that AT&T will continue to sell and support both PBXs separately. "Although we're merging the two PBXs over time, they will remain as separate products," he said.

Users contacted were generally supportive of the move and said they expect advantages for users of both switches, though some expressed unease with the prospect of any type of basic change. Tom Frenette, president of the System 85 Users Group, said the statement of direction is "basically a good move.

"It's certainly going to make all of us a little queasy for a while, because there's going to have to be some changeouts in either the System 85 or the System 75," he said. Specific benefits Frenette said he expects are that the PBXs will be "easier to administer and easier to expand."

Frenette forecasted that a typical merged System 75/85 would be based on the System 85's processor but use the eight-port circuit cards of the System 75, instead of the System 85's four-port cards.

AT&T's Griffiths confirmed the System 85 will be modified to support the System 75's line cards but declined to explain how the change will be engineered.

Although the two switches can be linked today using AT&T's Distributed Communications System (DCS) package, or tied together in an Electronic Tandem Network, merging the switches would provide more migration options for customers with both types of switches.

But according to Spencer Rice, a consultant who says he formerly worked on both switches as an AT&T engineer, the intent to merge the pair is misguided. Rice argued that DCS already provides the means to integrate the switches and that the two switches technologically cannot be fully merged because they have "totally different architectures.

"It's a marketing positioning rather than a technological breakthrough," said Rice, currently president of S&R Consultants Ltd., a Madison, N.J.-based firm that specializes in communications and office automation.

But Griffiths said the integration DCS offers is not tight enough to allow the System 75 to function as one of the up to 31 modules within a System 85. The new plan will let users with both PBXs who find they have outgrown the 800-line capacity of the System 75 to recycle the switch by folding it into their System 85, rather than junking it for a larger machine.

The System 85, which can support up to 32,000 lines, has an architecture that is both hierarchical and distributed. A master control unit occupies the highest position in 85 hierarchy, controlling up to 31 lower level switch modules, each comprising up to four cabinets.

To turn a System 75 into a System 85 module, the switch's Intel Corp. 8086 microprocessor will have to be swapped for the larger switch's proprietary processor, a set of boards called the 501CC. With some other design changes, it will be possible to retain System 75 line cards, carrier shelves, power supply and the cabinet itself.

"In effect, you replace the processor with a more powerful processor and use all the rest of the equipment," Griffiths said.

Besides providing migration options, Griffiths said, use of System 75 modules within a System 85 will reduce the space requirements of the larger switch.

# Chevron paces expert system

continued from page 2

be able to diagnose both IBM and non-IBM equipment on the network. The expert system is currently capable of diagnosing problems in IBM terminal controllers, IBM and Racal-Milgo, Inc. modems, and analog circuits on the network. She said the project plans include extending support to digital circuits and data service units.

Joshi said the goal of the DRnet project is to enable lower level network support staff to handle 25% of problems concerning transmission lines, modems, control units and circuits.

"When I started this project I sat down and read through about 300 incident reports and [saw] that most problems we have on the network are reasonably basic ones," Joshi said. "The kinds of problems we really need to check carefully, like phase jitter or protocol analysis, are not 90% of the problems. We want the system to be able to do the most basic things, like checking modem lines and running the basic tests on request," she said.

> "DRnet is still very much in beta test," Joshi said. "It is not being used in real applications. I'm testing the system on one or two real problems every day."

The system runs on an Epson America, Inc. Equity 3+ personal computer, an IBM Personal Computer AT-compatible, and it is outfitted with a Digital Communications Associates, Inc. Irma board that allows the micro to communicate with the mainframe as a terminal.

The program is based on an expert system shell — the Aion Development System — made by Aion Corp. This shell provides DRnet's inference engine, which uses the 120 "states" and 200 to 300 "rules" programmed into its knowledge base to diagnose network problems.

States, according to Joshi, are subprograms that enable the problem being solved to be broken down into smaller subproblems. Rules are a series of if-then statements that the system follows in locating and solving a problem.

In the knowledge acquisition stage of DRnet's development, Joshi said she drew on her own experience in the communications field — network design and performance — and worked closely with one of Chevron's network troubleshooting experts. She said she has been doing coding for DRnet for the last four months.

"DRnet is still very much in beta test," she said. "It is not being used in real applications. Right now, I'm trying to test the system on one or two real problems every day and, based on the tests, find out if the system is responding correctly and then make adjustments to it."

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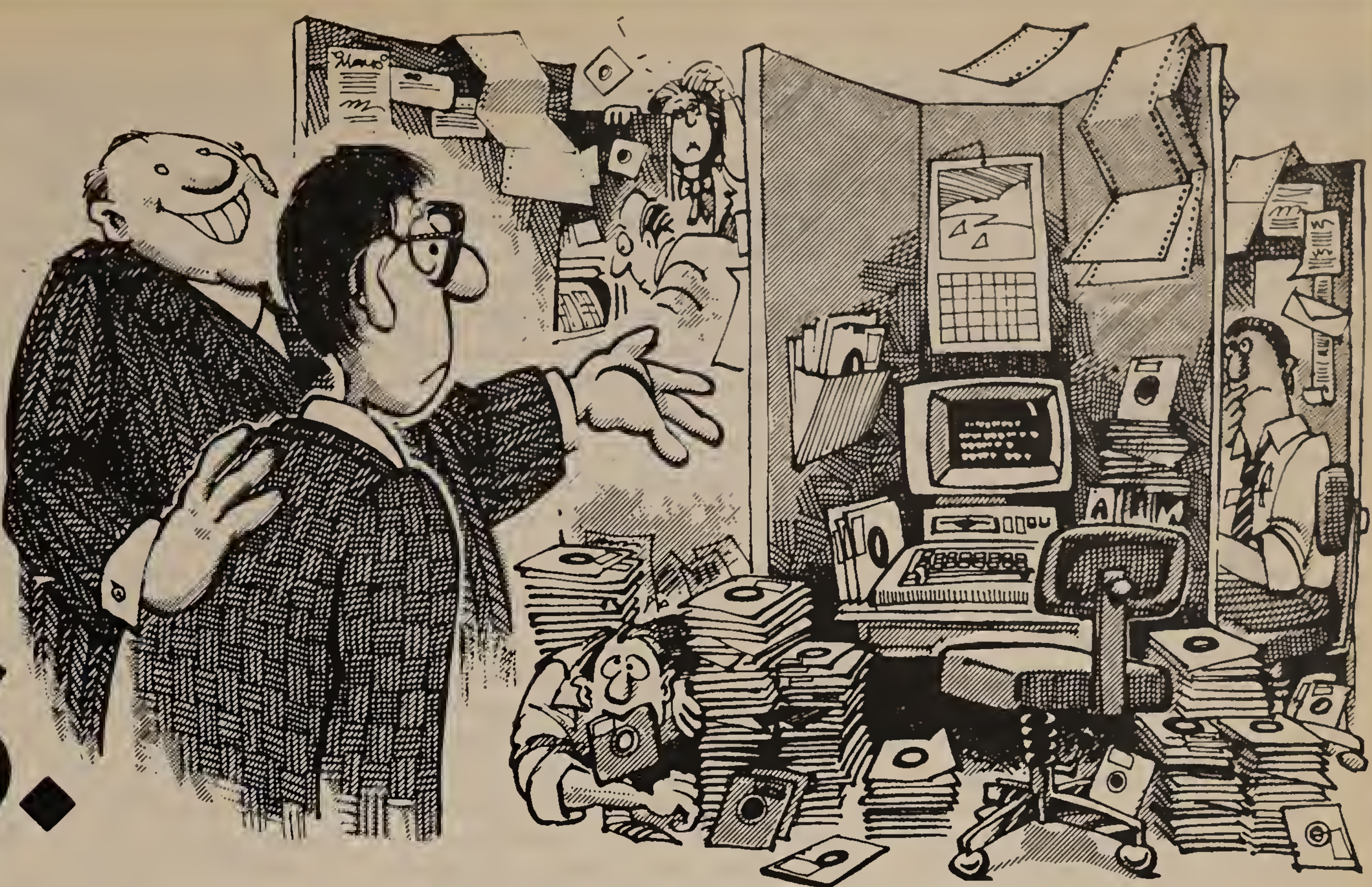
# THE DP BLUES.



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# Startup targets bridge mart

continued from page 6

protocols, but can only operate in single route networks.

Conversely, routers overcome these limitations at the expense of greater throughput. By combining the capabilities of each, Wellfleet provides a flexible device for interconnecting network segments in a large building or campus environment and in a wide area.

Wide-area interfaces supported include T-1 interfaces compatible with AT&T Accunet D4 and Extended Superframe formats and high-speed synchronous full-duplex interfaces compatible with V.35 or RS-449 standards.

The products also include a learning bridge that learns the addresses associated with all devices in connected networks. This allows the bridge to keep track of local addresses dynamically and pass through only traffic that is intended for remote addresses.

The bridges also provide "N-way" multiprotocol routing and bridging, which means that routing and bridging are accomplished between all connected links, so that information can be routed from local net to local net, local net to wide-area net or wide area to wide area.

The bridges' modular hardware and software architecture is designed to minimize throughput degradation by adding a Motorola, Inc. 68020 32-bit microprocessor for each link added to the device.

Single-site network management software is also available with the bridges that allow network operators to define system configurations and network parameters, perform network diagnostics and fault isolation, and generate network performance reports.

The network management software is menu-driven and accessed through an asynchronous terminal or personal computer attached to the bridge.

Wellfleet is targeting industry, universities, government and research organizations with geographically dispersed computer environments supported by Ethernet and different higher level protocols, according to the company. More specifically, the firm is targeting customers not likely to have experience with wide-area networking.

Prices for the LN start at $10,800, and prices for the CN start at $16,000. Both products are due to ship in the first quarter of 1988. ◘

# V.32 modems steal spotlight

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Jeff Held, group manager at Network Strategies, Inc., a Fairfax, Va., consulting firm, said companies are using the products for microcomputer-to-host file transfers. Low-speed modems can require as long as 15 minutes to transfer a 1M-byte file, a fact that frustrates many users.

IDC's Villars said users are quickly migrating from 1,200 bit/sec and 2,400 bit/sec modems to 9.6K bit/sec modems, skipping 4.8K bit/sec dial-up modems. Tymnet/McDonnell Douglas Network Systems Co., which provides a public data network service, said the shift was the reason behind its recently announced 9.6K bit/sec dial-up access service to its packet network. The service, TymDial 9.6, will be available in 10 locations by the end of the year.

Held said the high-speed modem market will expand as users design new applications requiring high-speed transmission, such as graphics applications. Also, the products can be used for gateways between local- and wide-area networks.

V.32 modems do have limitations. Tymnet said its service would appeal to customers with interactive applications. Network Strategies' Held said this is because trellis-coded modulation works best when only one side of a link is transmitting data, as with file-transfer applications.

Another problem is that the various implementations of the standard do not talk to one another. For example, a Concord modem may not be able to transmit data to a Racal-Vadic modem. Villars said, "V.32 is a complex standard, and there were a lot of options vendors could take in designing their products."

He predicted a finite standard would appear only after a market leader emerged. Villars noted that, once Hayes Microcomputers established itself as the leader in the low-speed modem market, other vendors were forced to add Hayes-compatibility to their products.

The price cutting may weed out weak modem vendors. Villars said modem shipments increased by 13% in 1986, but revenue increased by only 7%; companies were selling more products but making less money.

Vendors are trying to offset revenue reductions by paring costs via improved production techniques and staff cuts. Analysts said some vendors may not be in a position to withstand further price reductions. ◘

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# CALENDAR

**Oct. 26, Dallas — WATS Alert: What You Must Know About the Latest Long-Distance Service Options.** Also, Oct. 29, Chicago; Nov. 4, New York. Contact: BCR Enterprises, Inc., 950 York Road, Hinsdale, Ill. 60521.

**Oct. 26-28, New York — The VAX Business User Forum.** Contact: Dorothy Ferriter, IDG Conference Management Group, P.O. Box 9171, Framingham, Mass. 01701.

**Oct. 26-28, Los Angeles — PC LANs: A Manager's Guide.** Contact: Technology Transfer Institute, 741 Tenth St., Santa Monica, Calif. 90402.

**Oct. 27-28, New York — Unix Expo.** Contact: National Expositions Company, Inc., Suite 12A, 49 W. 38th St., New York, N.Y. 10018.

**Oct. 27-28, Stamford, Conn. — 1988 MAPTEK USA Communications Opportunities Strategy Conference.** Contact: Quantum Group International, Inc., 1114 Avenue of the Americas, New York, N.Y. 10036.

**Oct. 27-29, Atlanta — Manufacturing Automation Protocol: Plant-Wide Design and Planning.** Contact: Maria Kisell, Computer and Automated Systems Association of the Society of Manufacturing Engineers, One SME Drive, P.O. Box 930, Dearborn, Mich. 48121.

**Oct. 28-30, Portland, Ore. — Oregon Chapter of the Tele-Communications Association's Fourth Annual Conference and Trade Show.** Contact: Susan Vandenburgh, 3121 S.W. Moody Ave., Portland, Ore. 97201.

**Nov. 2-6, Las Vegas — COMDEX Fall '87.** Contact: The Interface Group, Inc., 300 First Ave., Needham, Mass. 02194.

**Nov. 5-6, Los Angeles — Satellite Technology: A Seminar for the Non-Technical Manager & Executive.** Also, Dec. 1-2, Atlanta. Contact: Phillips Publishing, Inc., 7811 Montrose Road, Potomac, Md. 20854.

**Nov. 9-10, Bethesda, Md. — The Post-Divestiture Tariffs and Their Impact on Large Networks.** Contact: Michele Zbiegniewicz, The Aries Group, Inc., Suite 320, 1500 Research Blvd., Rockville, Md. 20850.

**Nov. 11-12, Bethesda, Md. — Making Advances in Understanding Telecommunications Tariffs.** Contact: The Aries Group, Inc., Suite 320, 1500 Research Blvd., Rockville, Md. 20850.

**Nov. 18-19, Washington, D.C. — Electronic Organizations.** Contact: International Center for Information Technologies, 2000 M St. N.W., Washington, D.C. 20036.

# Freddie Mac finds trouble

continued from page 1

without being told about it.

Headquartered here, Freddie Mac is a nationwide organization that buys home mortgage loans from lenders and repackages them for sale as securities. It is the second largest secondary mortgage seller in the U.S., behind the Federal National Mortgage Association.

Freddie Mac began the gateway project to provide local net users in regional offices with a more efficient means of communicating with the IBM host. The firm has 25 Novell NetWare-based networks housed in regional offices around the country and at its headquarters. The networks support some 400 users.

These users are running network-based applications that work with host programs. They are also running applications developed to run only in a local networking environment.

"[IBM] CICS-based programs such as accounting for loans have been ported to the LANs, allowing users to do things they had been doing on 3178s [terminals], but without eating up host resources for data entry and minimal processing tasks," said Otto Doll, director of technical services. "This lets the regional offices perform operations during the day at their pace and then transmit the bulk data back to the host at night."

Although Freddie Mac's NAS gateways, which Novell initially recommended and supported before its acquisition of CXI, are now up and running around the country, Doll said he's disappointed that it took so long to iron out problems.

"We encountered 14 or 15 specific problems that took a very long time and a lot of infighting between Novell and NAS to iron out," Doll said. "It was difficult to get to the point where we have smoothly running gateways to our IBM SNA network."

Doll said Freddie Mac tested CXI gateways but could not get them to operate properly and decided not to use the products.

Among the thorniest product-related problems Freddie Mac had to work out were such things as gateways freezing, communications sessions at the mainframe spontaneously locking in a way that made it impossible to reactivate them and misrouting of data packets, according to Bryant Potosky, communications systems programmer with Freddie Mac.

"The worst was that two or more individuals on the LAN could end up swapping sessions and swapping user IDs in the middle of typing, usually when they somewhat simultaneously hit enter," he said.

"To my knowledge, that's a problem that's never been reported," said Bob Craven, vice-president of research and development at Novell. "I'd be surprised if that one is ours. As a company, we're committed to making sure that all the products work reliably and efficiently. If there are problems, we'll make them go away."

In addition to gateways not operating properly, Doll said the Novell software eats up too much workstation memory for Freddie Mac applications. Doll blamed the problem on the memory requirements of Novell's Network Basic I/O System shell. "We only had 250K to 340K bytes of memory to run applications on the network workstations. This is not sufficient for some of our applications," Doll said.

"Memory is a common problem to all 640K-limit machines. I think Novell is continually working to reduce the memory, but when you only have 640K to start with, it's hard to leave an awful lot," Craven said.

Service and support problems surrounding the gateways were another thorn in Freddie Mac's side. Such problems involved finger pointing between Novell and NAS and arguments over whose responsibility it was to solve the problems, according to Potosky.

Because Novell's products operate with a great variety of other products, such problems do occur, acknowledged Jim Bills, vice-president of Novell Services Division. "Our division was formed less than a year ago, specifically to eliminate any finger pointing. Our purpose is to provide a one-stop call to solve the problem."

Novell eventually gave Freddie Mac a patched NetWare shell, the portion of the program that runs in network workstations. Although the patch eliminated the problem, Potosky is concerned that the next release of NetWare may not include the patch. "It's very hard to get information out of Novell," he said.

Doll was also disappointed that Novell never came forward with a proposal to provide nationwide service for the equipment, even though he sought one from the vendor in a request for proposal. "Novell has a nationwide service organization, but it just couldn't come across with a detailed proposal that said, 'This is what we do for this much money,' " Doll said.

Account Data Group eventually ended up with the national service contract, despite the fact that it is based in the Washington, D.C. area. "I'm not meeting my service objectives in areas like L.A., because Account Data technicians have to fly across country to service problems there. But at least I'm getting some service."

"We worked with Freddie Mac to help them generate an RFP, which we never received," said Tom Leers, director of NetWare Services Division sales and marketing. "We were looking forward to it, and we're confused that we didn't get it," Leers said.

Desite all of the outside problems Freddie Mac encountered, Doll said he takes some of the blame because he feels his organization didn't adequately test the equipment before committing to it.

"We were under great pressure to provide the [gateway] capability, but if I had to do it again, I would have really tested everything," he emphasized. "These problems have got to be ferreted out before you commit. That was the hard lesson we learned."

Despite the problems encountered, Doll now feels the gateway project is a success. All but two or three minor problems have been worked out, Potosky said.

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# CMA: Helping users cope

continued from page 1

vendors.

CMA, which is holding its annual conference and exposition here this week, primarily serves communications managers in New York, New Jersey, New England, Pennsylvania and Delaware.

In fact, among the group's more than 200 member companies are 175 of the Fortune 500 corporations. Combined, CMA members have an annual telecommunications buying power in excess of $1 billion.

CMA members must have annual telecommunications expenses of $1 million, exclusive of salaries. Members cannot be predominantly engaged in producing or selling telecommunications services, equipment or consulting services. Individual CMA members, according to the group, oversee their corporations' telecommunications facilities and services.

In the 39 years since Walter Young, then communications manager at Shell Oil Co., began gathering a handful of his peers together to discuss common concerns, CMA has greatly increased its size and the scope of its activities, while continuing in its primary role of serving communications professionals.

Not surprisingly, the biggest changes in the organization have occurred since AT&T's divestiture. "CMA used to be kind of a collective bargaining unit for dealing with the Bell System," said Bob Johnston, manager of telephone services at Exxon Corp. Now, Johnston said, the group has shifted from leveraging its power with the nation's telecommunications monopoly to helping CMA members deal with the problems and opportunities posed by divestiture and by technological breakthroughs.

Because CMA's conference is popular with vendors, the group is able to use the fees it charges exhibitors to underwrite tariff and regulatory update services for its members and to enlist speakers for its quarterly meetings throughout the year.

Economics & Technology, Inc., a Boston-based firm specializing in economic and tariff consulting services, provides CMA members with monthly updates on tariff and regulatory issues affecting the Northeastern states.

Brian Moir, an attorney with the Washington, D.C.-based law firm Fisher, Wayland, Cooper and Leader, provides a similar service for national tariff and regulatory issues, according to CMA President Don Gaffney.

The group's vendor liaison committee helps members keep abreast of equipment and service offerings by arranging for vendors to make presentations during CMA meetings and by providing a clearinghouse for vendor mailings. "We do not make our membership roster available to vendors," Gaffney said. "The vendors can send any material they want and pay for postage so we can forward it to members."

In addition to helping members with regulatory-, tariff- and vendor-related matters, Gaffney said the CMA is constantly trying to improve the image of the communications manager by urging members to become more aware of their companies' business goals.

This theme is stressed during CMA meetings, according to Gaffney. Moreover, the CMA will soon begin producing a quarterly magazine, which will prominently feature articles on the strategic use of communications, Gaffney said.

"Communications managers have to understand their business marketplace," Gaffney said. "Communications is no longer simply an expense. All of the leading edge companies are putting communications to work for them and locking in markets."

Gaffney's company, Fundamental Information Systems, a subsidiary of Williams Street Brokers in New York, provides information systems and communications support for the brokerage house.

Jerald Marcone, assistant vice-president of telecommunications at Crum & Forster Corp. in Morristown N.J., shares Gaffney's views on the strategic use of communications and backs CMA's efforts to make its members aware of the importance of general business skills.

Marcone, however, said he is concerned that data processing professionals have a clearer career path than that open to communications professionals. And, he said, he is not sure what steps CMA can take to better its members' chances of making it to the executive suite.

Marcone said CMA is considering moving its annual conference and exposition from Long Island, N.Y., to Manhattan, N.Y., in an effort to attract more visitors and to raise the group's profile within the industry.'"One of the problems we have is that we are conceived by many as a regional organization," Marcone said. "But, although the members are in the Northeast region, many of them have responsibilities that go beyond that area. I'm responsible for well over 100 sites in the U.S. We feel that the New York, New Jersey and Connecticut area could have the highest concentration of buying power in the nation. We want to take advantage of that and expand CMA's role."

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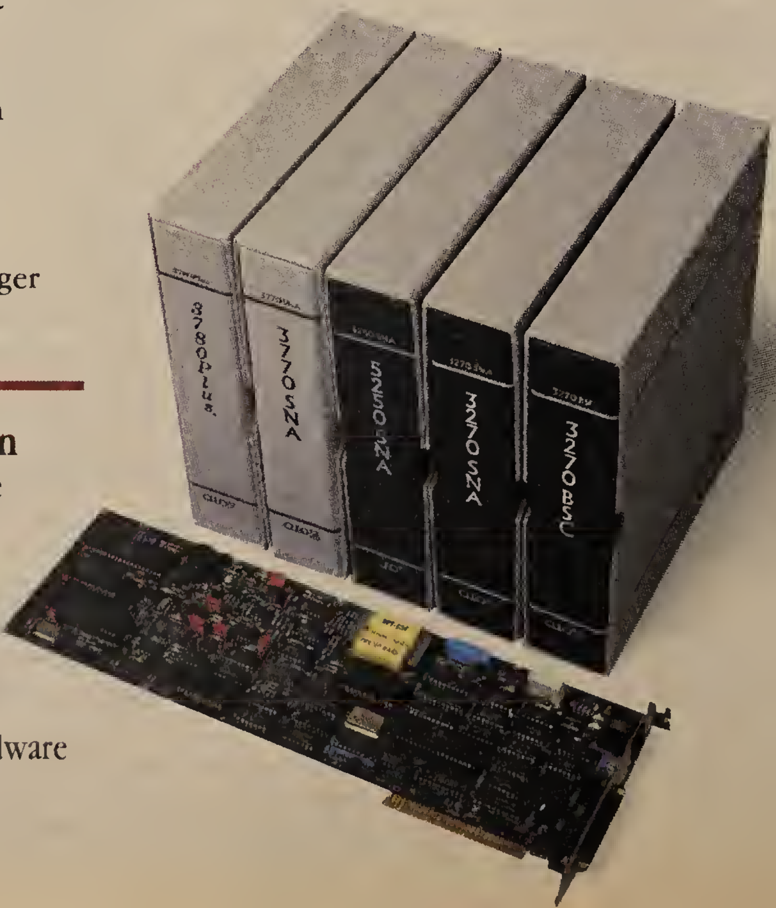

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